Installation and Maintenance Manual IM 1072-3

Group: **WSHP**
Part Number: **910163742**
Date: **February 2015**

Daikin Water to Water Source Heat Pumps

3 to 35 Tons with R-410A

WRA - Heating and Cooling Models
WHA - Heating Only Models
WCA - Cooling Only Models

People and ideas you can trust.™

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Category	Code Item	Code Option	Code Designation & Description
Product Category	**1**	**1**	W = Water Source Heat Pump
Product Identifier	**2**	**2-4**	WCA = Base Cooling Only Unit with Copper Coaxial Water Coils WHA = Base Heating Only Unit with Copper Coaxial Water Coils WRA = Base Cooling and Heating Only Unit with Copper Coaxial Water Coils
Design Series	**3**	**5**	1 = 1st Design 2 = 2nd Design 3 = 3rd Design 4 = 4th Design
Nominal Capacity	**4**	**6-8**	036 = 36,000 Btuh Nominal Cooling 048 = 48,000 Btuh Nominal Cooling 060 = 60,000 Btuh Nominal Cooling 072 = 72,000 Btuh Nominal Cooling 120 = 120,000 Btuh Nominal Cooling 150 = 150,000 Btuh Nominal Cooling 180 = 180,000 Btuh Nominal Cooling 240 = 240,000 Btuh Nominal Cooling 300 = 300,000 Btuh Nominal Cooling 360 = 360,000 Btuh Nominal Cooling 420 = 420,000 Btuh Nominal Cooling
Unit Control	**5**	**9**	A = ALC control for standard Sequence of Operations (See Note) L = ALC control w/ Lonworks card D = Terminal strips for field-mounted DDC controls T = Terminal strips for aquastat control

Note: *ALC controls include built-in communication card for BACnet®, Modbus and N2 protocols. For use with LONWORKS® protocol, the accessory LONWORKS Card must also be selected. It is required that at least one BACview6 handheld be purchased per jobsite unless other means of communicating with the controller is being used. If an ALC control with a non-standard sequence of operations is required, contact factory for pricing.*

Voltage	**6**	**10**	E = 208-230/60/1 F = 208-230/60/3 K = 460/60/3 L = 575/60/3
Head Pressure Control **A selection must be made from this section for units only if unit will operate as decribed below:**	**7**	**11**	Y = None

Units operating in cooling mode with an entering water temperature of 75°F (23.9°C) or higher do not require water regulating valves.
Units operating AT ANY TIME in cooling mode with an entering water temperature less than 75°F (23.9°C) require water regulating valves. Includes valves, bypass refrigeration circuit and check valve.

Water Piping Location	**8**	**12**	F = Front T = Top L = Left Hand Side R = Right Hand Side
Control Box Location	**9**	**13**	F = Front L = Left Side Control Box R = Right Side Control Box
Status Lights	**10**	**14-15**	YY = None SL = Three Lights-Compressor-1, Compressor-2, Compressor fault
Freezestat	**11**	**16-17**	YY = None FS = Adjustable for Geothermal and Boiler/Tower Application
Construction Type	**12**	**18**	A = Standard
Source Water to Refrigerant Heat Exchanger Construction	**13**	**19**	C = Copper Coax L = Load Side Cupro Nickel Coax S = Source Side Cupro Nickel Coax B = Load & Source Side Cupro Nickel Coax
Desuperheater	**14**	**20**	Y = None D = Waste Heat Recovery Water Heater
Refrigerant	**15**	**21**	A = R-410A
Cabinet Electrical	**22**		YYY= Reserved for future use

Safe Operation Rules

Installation and maintenance are to be performed only by qualified personnel who are familiar with and in compliance with state, local and national codes and regulations, and experienced with this type of equipment.

Please take a few minutes to read the instructions before you install the heat pump. This will help you obtain the full value from this unit. It will also help you avoid needless costs that result from incorrect installation and are not covered in the warranty.

Follow these instructions carefully. Failure to do so could cause a malfunction of the heat pump, resulting in injury, death and/or property damage.

Tubing and compressor contain high pressure refrigerant and they must not be exposed to high temperature or be punctured.

⚠ WARNING

To prevent electrical shock, disconnect electric power to system at main fuse or circuit breaker box until installation is complete.

⚠ CAUTION

Sharp edges can cause personal injury. Avoid contact with them.

Safety and Signal Words

The signal words DANGER, WARNING and CAUTION are used to identify levels of hazard seriousness. The signal word DANGER is only used on product labels to signify an immediate hazard. The signal words WARNING and CAUTION will be used on product labels and throughout this manual and other manuals that may apply to the product.

DANGER

Immediate hazards which WILL result in severe personal injury or death.

WARNING

Hazards or unsafe practices which COULD result in severe personal injury or death.

CAUTION

Hazards or unsafe practices which COULD result in minor personal injury or product or property damage.

Danger Label

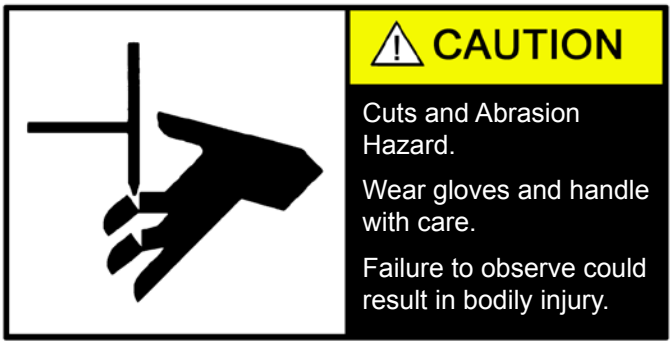
White lettering on a black background except the word DANGER which is white with a red background.

Warning Label

White lettering on a black background except the word WARNING which is white with an orange background.

Caution Label

White lettering on a black background except the word CAUTION which is white with a yellow background.



⚠ WARNING

This unit contains HFC-(R-410A), a azeotropic mixture of R-32 (Difluoromethane) and R-125 (Pentafluoroethane). **Do Not Vent** HFC-(R-410A) to the atmoshpere. The U.S. Clean Air Act requires the recovery of any residual refrigerant. Do not use R-22 service equipment or components on R-410A systems.

WRA, WHA, WCA 036 – 420

Table 1: Electrical data

Unit Size	Voltage/Hz/Ph	Compressor			Total Unit FLA	Voltage Min./Max.	Minimum Circuit Ampacity	Max. Circuit Breaker	Maximum Fuse HACR Breaker
		Quantity	RLA (each)	LRA (each)					
036	208-230/60/1	1	16.7	79.0	33.4	197/253	20.9	35	35
	208-230/60/3		10.4	73.0	20.8	187/253	13.0	20	20
	460/60/3		5.8	38.0	11.6	414/506	7.3	15	15
	575/60/3		3.8	36.5	7.6	517/632	4.8	15	15
048	208-230/60/1	1	19.9	109.0	39.8	197/253	24.9	40	40
	208-230/60/3		13.6	83.1	27.2	187/253	17.0	30	30
	460/60/3		6.1	41.0	12.2	414/506	7.6	15	15
	575/60/3		4.2	33.0	8.4	517/632	5.3	15	15
060	208-230/60/1	1	23.1	134.0	46.2	197/253	28.9	50	50
	208-230/60/3		16.1	91.0	32.2	187/253	20.1	35	35
	460/60/3		7.1	46.0	14.2	414/506	8.9	15	15
	575/60/3		5.6	37.0	11.2	517/632	7.0	15	15
072	208-230/60/3	1	20.6	155.0	41.2	187/253	25.8	45	45
	460/60/3		9.7	75.0	19.4	414/506	12.1	20	20
	575/60/3		7.7	54.0	15.4	517/632	9.6	15	15
120	208-230/60/3	2	16.1	91.0	32.2	187/253	36.2	50	50
	460/60/3		7.1	46.0	14.2	414/506	16.0	20	20
	575/60/3		5.6	37.0	11.2	517/632	12.6	15	15
150	208-230/60/3	2	20.6	155.0	41.2	187/253	46.4	60	60
	460/60/3		9.7	75.0	19.4	414/506	21.8	30	30
	575/60/3		7.7	54.0	15.4	517/632	17.3	25	25
180	208-230/60/3	2	25.0	164.0	50.0	187/253	56.3	80	80
	460/60/3		12.2	100.0	24.4	414/506	27.5	35	35
	575/60/3		9.0	78.0	18.0	517/632	20.3	25	25
240	208-230/60/3	2	30.2	225.0	60.4	187/253	68.0	90	90
	460/60/3		16.7	114.0	33.4	414/506	37.6	50	50
	575/60/3		12.2	80.0	24.4	517/632	27.5	35	35
300	208-230/60/3	2	33.4	239.0	66.8	187/253	75.2	100	100
	460/60/3		18.0	125.0	36.0	414/506	40.5	50	50
	575/60/3		12.9	80.0	25.8	517/632	29.0	40	40
360	208-230/60/3	2	51.3	300.0	102.6	187/253	115.4	150	150
	460/60/3		23.1	150.0	46.2	414/506	52.0	70	70
	575/60/3		19.9	109.0	39.8	517/632	44.8	60	60
420	208-230/60/3	2	55.8	340.0	111.6	187/253	125.6	175	175
	460/60/3		27.0	173.0	54.0	414/506	60.8	80	80
	575/60/3		23.8	132.0	47.6	517/632	53.6	70	70

Legend:

***FLA** = Full Load Amps*
***HACR** = Heating, Air Conditioning and Refrigeration Breaker*
***LRA** = Lock Rotor Amps*
***RLA** = Rated Load Amps*

Pre-Installation and Code Requirements

After removing the unit from the carton, immediately remove the panels and inspect for any damage that might have occurred during shipment. Report concealed damage immediately to the transportation company and request inspection.

The electric power source must be the same voltage and phase as shown on the serial plate. Line and low voltage wiring must be done in accordance with local codes or the national electric code.

Make a survey of the final location for the unit before setting it in place. The unit should be centrally located with respect to the distribution system. Install the unit within a heated area. Exposure to inclement weather conditions may cause freeze damage that is not covered by the warranty.

Table 2: Capacity data

Model	Heating (Btuh)	Cooling (Btuh)
036	48,200	34,300
048	58,200	42,100
060	67,200	46,000
072	85,500	62,200
120	129,000	94,500
150	170,400	122,140
180	237,000	157,000
240	290,900	202,400
300	339,720	221,800
360	416,900	284,700
420	493,200	358,600

Notes: *At standard rating conditions of:*

Heating - *100°F entering load water, 70°F entering source water.*

Cooling - *55°F entering load water, 85°F entering source water.*

Mounting the Unit

The unit should be mounted level on a vibration absorbing pad slightly larger than the base to provide isolation between the unit and the floor. It is not necessary to anchor the unit to the floor.

The electrical connections are accessible from the front. The compressor can be accessed from either side. A minimum of 24" clearance in front and sides of the unit should be provided to allow sufficient room to make water and electrical connections. If the unit is located in a confined space such as a closet, provisions must be made for unit servicing. Unit sizes 036 thru 072 may be stacked vertically (2 high) in tight mechanical rooms.

Piping the Unit

Both source and load connections must be at least as large as the connections on the unit. The unit may be furnished with either copper or optional cupronickel coil on either source or load coaxial heat exchanger. Cupronickel should always be used when chlorinated water or ground water which is high in mineral content is the load or source load fluid. Never use flexible hoses that are smaller (inside diameter) than that of the water connection on the unit. Make sure hoses and pipes are suitable for system water pressure and sized for proper flow rate.

The supply and the discharge pipes should be insulated to prevent condensation damage caused by low water temperature in the pipes.

If water hammer should occur during start-up or shut down, slow closing diaphragm type solenoid valves should be used. Placing the solenoid valve on the outlet side of the system helps relieve this situation. Due to high pressure drop or poor throttling characteristics, globe and gate valves should not be used, all flow valves should be ball type.

Domestic Hot Water Heat Recovery

The unit may have an optional factory installed waste heat recovery feature. The heat recovery device is factory piped to the refrigerant circuit of the unit. The plumbing to the water tank and the power to the recovery pump are to be completed in the field as required.

Care should be exercised in plumbing water lines to and from the water heater.

Note: *It is important that both water lines be insulated. For run less than 50 feet one way, use 1/2" O.D. water lines on models sizes 036 thru 072. A run over 50 feet should be avoided. On models 120 thru 420 specific system data must be matched to industry standard pipe sizing charts.*

To make a connection to Hot Water Heat Recovery:

1. Turn off power or gas valves to the water heater.
2. Turn off water supply to the water heater.
3. Open hot water faucet and drain tank.
4. Connect tubing to “Heat Recovery Water Out” on the unit and extend this line to the hot water heater. Attach to hot water heater with fittings.

⚠ CAUTION

Improper water flow in the system due to piping, valving or improper pump operating will void the warranty.

5. Connect tubing to “Heat Recovery Water In” on the unit and extend this line to the water heater. Attach to cold water supply. Place pump in this line.
6. Set water heater thermostat as follows:

7. Electric, Double element - Upper 125°F, Lower minimum Gas, Oil or Single element - 125°F
8. Wire according to single phase diagram (on page 14) and three phase diagram (on page 19 and on page 24).
9. The piping and wiring are now complete. Turn on water supply to water heater. With an open hot water faucet, allow tank to fill. Bleed air from water lines. Check for water leaks. Do not restore power to water heater until after you have verified that the heat recovery unit is working and you have hot water circulating back to the water heater. Restore power to the water heater.
10. On start up of the unit, make the following operation checks:
    - Pump runs only when the compressor is on
    - Pump is turned on by thermostat on compressor discharge line
    - All air is purged from water lines
    - Verify water circulation to and from water heater

Cooling Tower/ Boiler Application Closed Loop

Cooling Tower and Boiler Loop System temperature is usually maintained between 55°F and 90°F. In the cooling mode, heat is rejected from the unit into the source water loop. To reject excess heat from the water loop, the use of a closed circuit evaporative cooler or an open type cooling tower with a secondary heat exchanger between the tower and the water loop is recommended. When utilizing open cooling towers chemical water treatment is mandatory so that the water is free from corrosive minerals. It is imperative that all air be removed from the source closed loop side of the heat exchanger to protect against fouling.

In the heating mode, heat is absorbed from the source water loop. A boiler can be utilized to maintain the loop at the desired temperature. In milder climates a “flooded tower” concept is often used. This concept involves adding makeup water to the cooling tower sump to maintain the desired loop temperature.

When making water connections to unit sizes 036 thru 072, a Teflon taped thread sealant is recommended to minimize fouling of the pipes. Sweat connections are used for unit sizes 120 thru 420. The water lines should be routed so as not to interfere with access to the unit. The use of short lengths on high pressure hose with a swivel type fitting may simplify the connections and prevent vibration transmission to the building.

Before final connection to the unit, the supply and return hose kits must be connected together and the system flushed to remove dirt, piping chips and foreign material. Ball valves should be installed in the supply and return lines for unit isolation and unit water flow rate balancing. The return valve can be adjusted to obtain the proper flow rate whenever the unit heats or cools.

⚠ CAUTION

Water piping exposed to outside may freeze.

Pressure/temperature ports recommended both supply and return lines adjacent to the unit for system flow balancing. Flow can be accurately set by measuring the refrigerant-to-water heat exchangers water side pressure drop.

Well Water Application Open Loop

Water pressure must be maintained in the heat exchanger by placing water control valves at the outlet of the unit. A bladder type expansion tank may be used to maintain pressure on the system. Pressure/temperature ports should be used to set flow rates by checking pressure drop across the heat exchanger. Avoid using low voltage (24 volt) solenoids, using them may overload the unit transformer or interfere with the lockout impedance circuit. Line voltage solenoids across the load side of compressor contactor are recommended. Normally residential systems require about 2-gpm of flow rate per ton of cooling capacity is needed in open loop systems.

Discharge water from a heat pump is not contaminated in any manner and can be disposed of in various ways depending on local building codes.

Disposal methods may be by recharge well, storm sewer, drain field, adjacent stream or pond. Most local codes forbid the use of sanitary sewer for disposal. Consult the local building and zoning department to determine compliance in your area.

Earth Coupled Application Closed Loop

Earth coupled closed loop systems should follow the same International Ground Source Heat Pump Association guidelines used for closed loop heat pump applications. Once piping is completed between the loop pump kit and the earth loop, final purging and charging of the loop is required. A flush/purge assembly capable of obtaining a velocity of 2 fps throughout the entire system is required. Usually a pump of at least 1.5 hp will be adequate to purge air and dirt particles from the loop itself for most residential systems. Commercial systems must be sized carefully using pump manufacturer pump curves and system specific data. Flush the system adequately to remove as much air as possible then pressurize the loop to a static pressure of 20 to 30 psi. This is normally adequate for proper system operation. Check for proper flow through the unit by checking pressure drop across the heat exchanger and compare it to the cooling and heating operating pressure tables on page 12. In order to achieve proper cooling capacity in a earth coupled close loop application, a rate of 3 gpm per ton is required. Antifreeze solutions are required when low evaporating conditions are anticipated. Always use pressure/temperature ports to provide proper fluid flow rates.

Typical Load Side Applications

There are many load side applications for which the fluid to fluid liquid chiller heat pumps can be used. The most popular used would include: Hydronic baseboard heating, hydronic in-slab floor heating, forced air fan coil heating or cooling, ice and snow removal, heating potable water, heating swimming pools and spas, and process fluid heating and cooling. When specifying load side heat transfer surface it is important to consider the heat pump output capacities and fluid flow rates. Insufficient load side heat transfer surface may cause unstable heat pump operating. Pressure/temperature ports should always be used to determine load side flow rates. Avoid contact of dissimilar metals in the load side piping system.

The units can provide heating or cooling for pools and spas without the use of a secondary heat exchanger. This application would however require a cupronickel load side heat exchanger. Automatic chemical feeders must never be installed upstream of the heat pump. An external bypass should be installed to avoid over flowing the heat exchanger which could cause erosion. Proper pool PH levels and chemical balances must be maintained to avoid possible heat exchanger damage.

Start Up

Check before powering the unit

- Avoid starting any electrical equipment for the first time alone, always have another person a safe distance from the unit that can turn off the main power in the event of an accident
- High voltage supply matches the nameplate rating
- Field wire size, breakers and fuses are the correct size
- Low voltage control circuit is correct
- Water piping is complete and correct
- Closed loop system is flushed and purged
- Isolation valves are open
- Loop pumps are correctly wired
- Access panels are in place and secured
- Thermostat is in “off” position

Check, Test and Start (Form on page 44)

1. Set thermostat to highest position.
2. Set thermostat switch to “cool”. Compressor should not operate. The source water pump should energize.
3. Slowly lower the thermostat setting until the compressor is energized. Regulate the water flow utilizing the P/T plugs and compare to the performance tables.
4. Check the cooling refrigerant pressures against valves with the tables.
5. Turn thermostat switch to the “off” position. The unit will stop running and the reversing valve should de-energize.
6. Leave unit “off” for approximately five minutes to allow pressure to equalize.
7. Adjust thermostat to lowest setting.
8. Set thermostat switch to “heat” position.
9. Slowly adjust thermostat to higher temperature until compressor energizes.
10. Compare the heating refrigerant pressure with valves with the tables.
11. Check for vibrations, noise, water leaks, etc.
12. Adjust thermostat to correct mode and set to maintain desired temperature.
13. Instruct the equipment owner/operator of correct thermostat and system operation.
14. Be certain to complete and forward the warranty papers to Daikin.

Maintenance Procedures

Proper maintenance is important to provide the most efficient operation and longest life for your equipment. The following points are to serve as a general guide. Always consult with your maintenance contractor with regard to the specific requirements of your own installation.

Paint Finish

The electrodeposition paint finish may be polished if desired. Spray paint is available in case of accidental scratching or chipping.

The following should be checked only by a competent contractor

Contactor Points

Check contactor points twice a year to see that they are not burned or pitted as a result of low voltage, lightning strikes, or other electrical difficulties.

Water System

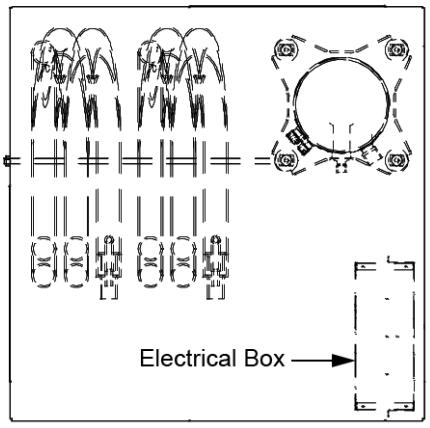
The water circulating pump should be checked and cleaned, so that it is operating normally. Clogged coils lead to high head pressures and inefficient operation. If coil is limed, a cleaning treatment may be necessary. Water coils should be checked yearly for liming or clogging.

Improper Unit Functioning

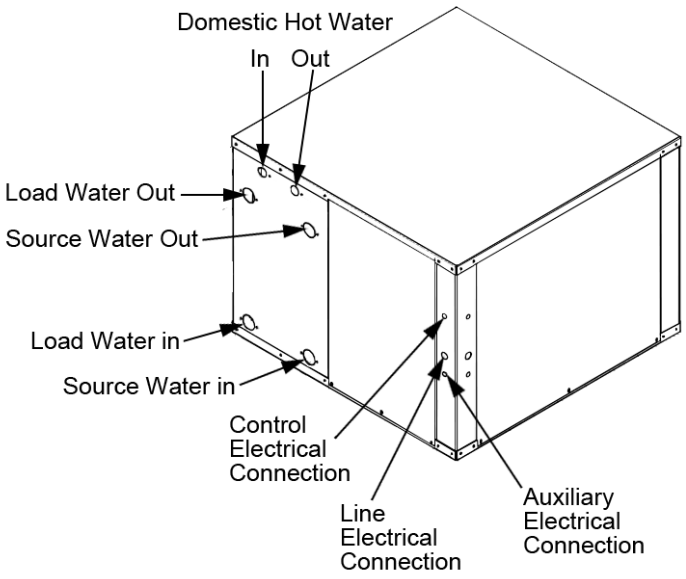
If unit is not performing properly, several readings of temperature, pressure and electrical characteristics need to be taken. The normal required troubleshooting information is listed on the Check, Test and Start Form on page 44.

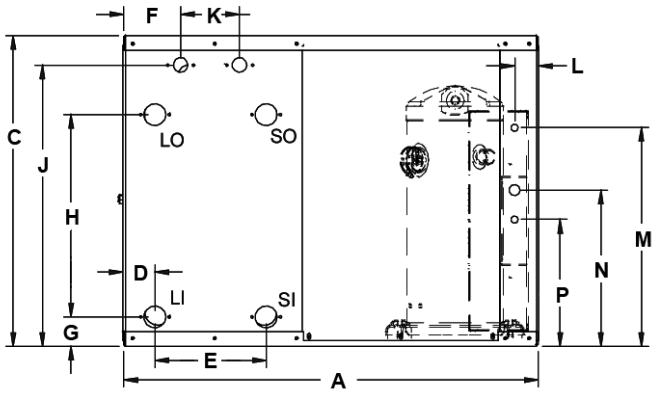
***Notes: DO NOT** place refrigeration gauges on system for Check, Test and Start procedure. (To be used for major service only.) **To Installer:** Fill out Check, Test and Start Form on page 44 and leave copy with the customer.*

WRA, WCA, WHA – Size 036-072

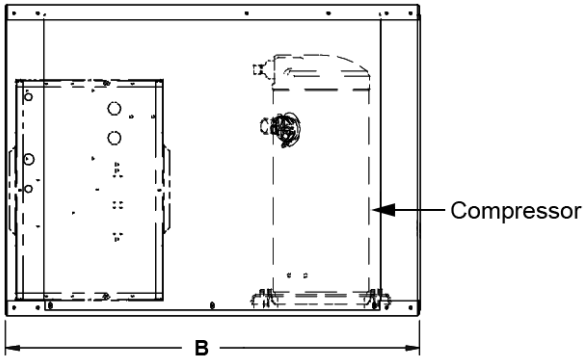


Top View





Front View



Right Side View

Dimensions - Size 036

Dimensions (in.)										Pipe Size (FPT)				Connection Size				
A	B	C	D	E	F	G	H	J	K	L	M	N	P	Control	Electric	Auxiliary Electric	Load Source	Domestic Hot Water
28⅛	28⅛	19	1¾	6⅜	3⅞	2	11⅞	17⅛	4	1½	14⅞	10⅝	8⅝	1/2" KO	3/4" KO	1/2" KO	3/4" FPT	1/2" FPT

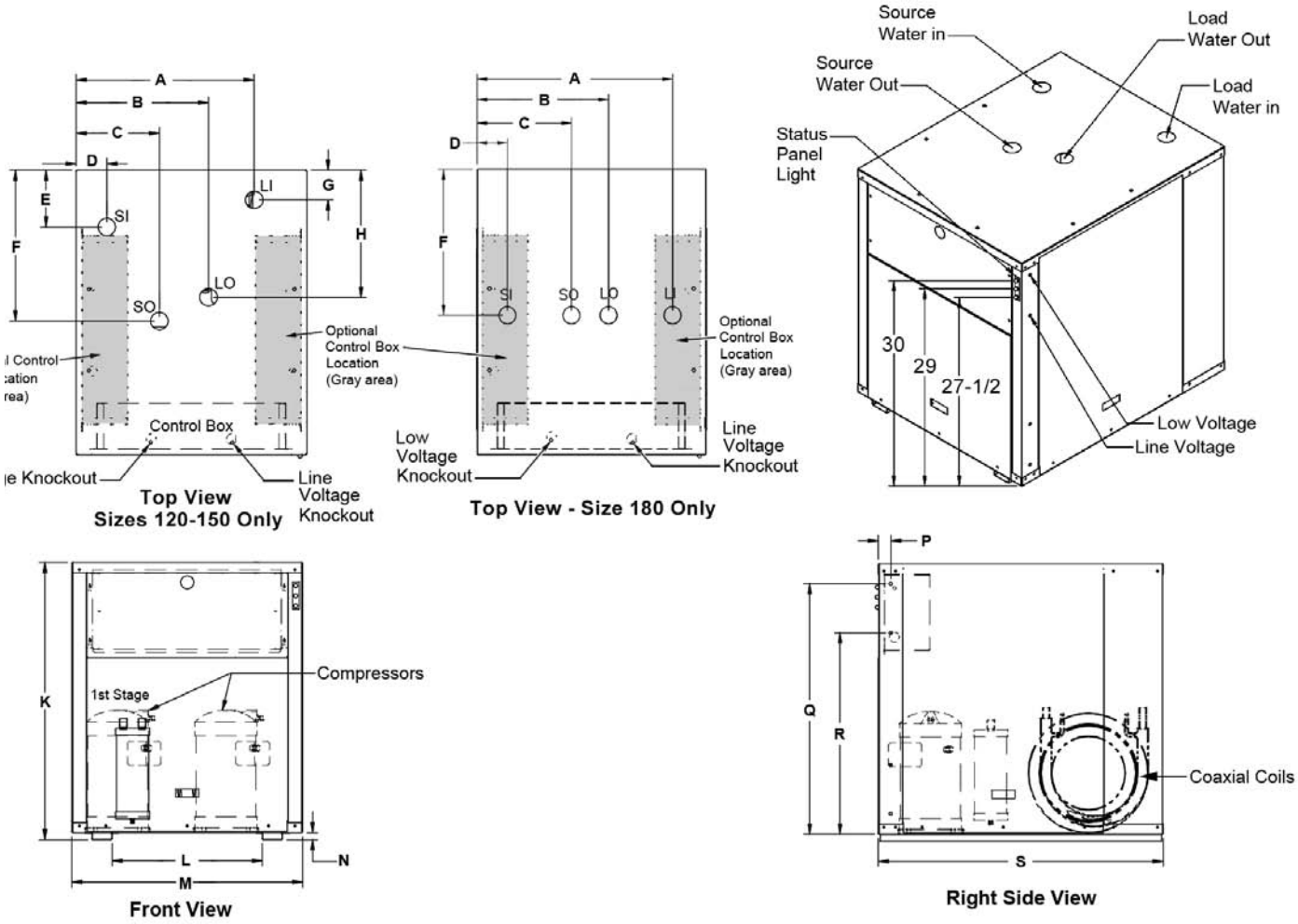
Dimensions - Size 048–060

Dimensions (in.)										Pipe Size (FPT)				Connection Size				
A	B	C	D	E	F	G	H	J	K	L	M	N	P	Control	Electric	Auxiliary Electric	Load Source	Domestic Hot Water
28⅛	28⅛	21	2¼	7½	3⅞	2	13¾	19	4	1½	14⅞	10⅝	8⅝	1/2" KO	3/4" KO	1/2" KO	1" FPT	1/2" FPT

Dimensions - Size 072

Dimensions (in.)										Pipe Size (FPT)				Connection Size				
A	B	C	D	E	F	G	H	J	K	L	M	N	P	Control	Electric	Auxiliary Electric	Load Source	Domestic Hot Water
35⅛	28⅛	21	$9^{11}/_{16}$	10⅝	10⅝	2	12¼	19	4	1½	14⅞	10⅝	8⅝	1/2" KO	3/4" KO	1/2" KO	1" FPT	1/2" FPT

WRA, WCA, WHA – Size 120-180



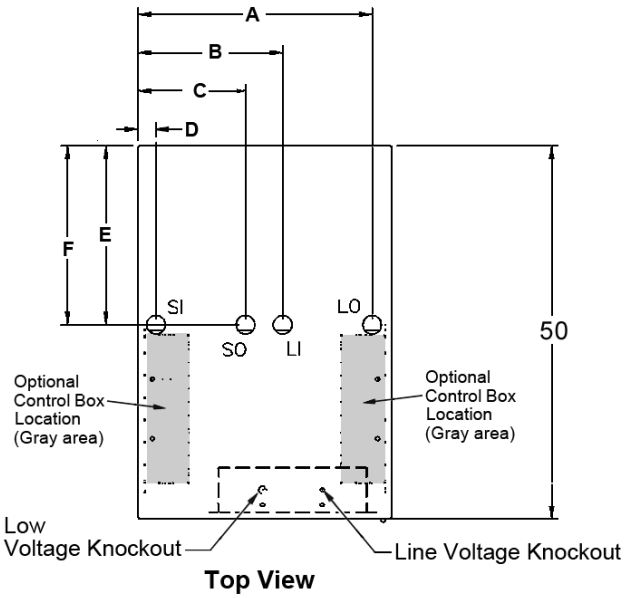
Dimensions - Size 120 – 150

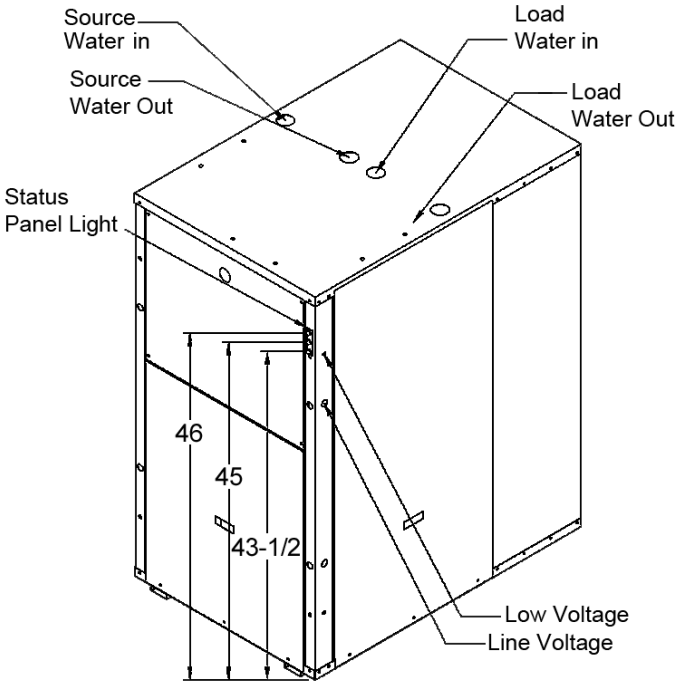
Dimensions (in.)																Water Connection Size
A	B	C	D	E	F	G	H	K	L	M	N	P	Q	R	S	Load Source FPT
26¼	19½	12¼	4½	8⅜	22¼	4⅜	18¾	41	22⅛	34	1	$1^{13}/_{16}$	37	29¾	42	1½"

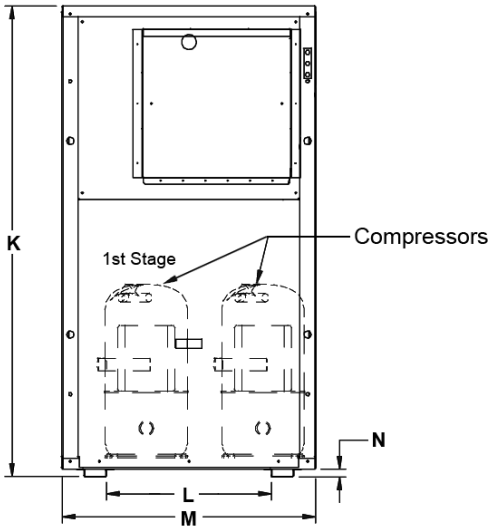
Dimensions - Size 180

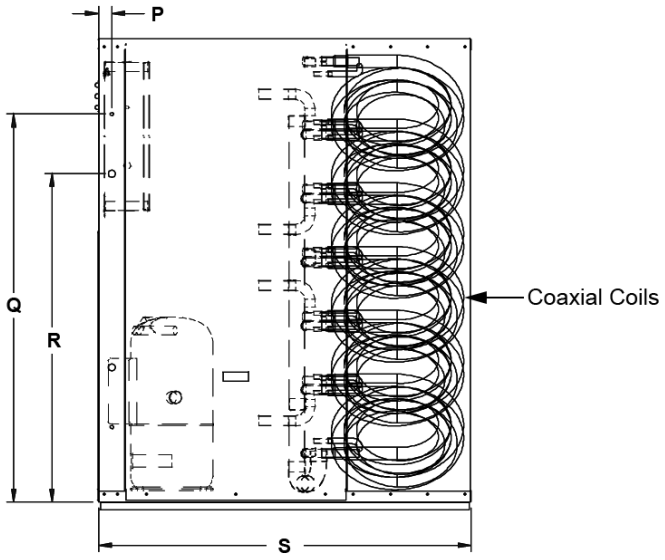
Dimensions (in.)																Water Connection Size
A	B	C	D	E	F	G	H	K	L	M	N	P	Q	R	S	Load Source FPT
29	19½	14	4½	8⅜	21½	4⅜	18¾	41	22⅛	34	1	$1^{13}/_{16}$	37	29¾	42	2"

WRA, WCA, WHA – Size 240-420









Dimensions - Size 240 – 420

Dimensions (in.)														Water Connection Size
A	B	C	D	E	F	K	L	M	N	P	Q	R	S	Load Source FPT
31⅛	19⅜	14⅜	2⅜	24	24	63⅛	22⅛	34	1	$1^{13}/_{16}$	52⅛	44⅛	50	2"

Physical Data

Table 3: WRA, WHA, WCA 036 – 420

Unit Size	Cabinet Dimensions (in.)			Unit Weight (lb.)		Factory Refrigerant Charge Per Cicuit (lb.)	Water Connections (in.)
	Width	Depth	Height	Operating	Shipping		FPT
036	28.125	28.125	19.00	250	259	2.80	0.75
048	28.125	28.125	21.00	297	300	3.50	1.00
060	28.125	28.125	21.00	302	505	4.40	1.00
072	35.125	28.125	21.00	320	370	5.00	1.00
120	34.00	42.00	41.00	570	610	2.75/2.75	1.50
150	34.00	42.00	41.00	735	770	4.25/4.25	1.50
180	34.00	42.00	41.00	900	950	8.00/8.00	2.00
240	34.00	50.00	63.125	1040	1140	10.0/10.0	2.00
300	34.00	50.00	63.125	1130	1230	16.0/16.0	2.00
360	34.00	50.00	63.125	1420	1540	17.5/17.5	2.00
420	34.00	50.00	63.125	1620	1750	20.0/20.0	2.00

Operating Pressures (PSIG)

Cooling Mode

Table 4: Models WRA and WCA

Leaving Load °F	Entering Source Temperature °F					
	50		70		90	
	Suction	Discharge	Suction	Discharge	Suction	Discharge
45	90-109	210-250	95-110	270-310	98-115	355-395
50	97-114	215-255	100-115	280-315	105-123	365-410
55	106-123	220-265	110-125	285-320	118-135	385-420

Heating Mode

Table 5: Models WRA and WHA

Entering Load °F	Entering Source Temperature °F							
	30		50		70		90	
	Suction	Discharge	Suction	Discharge	Suction	Discharge	Suction	Discharge
80	63-87	275-318	85-110	295-332	115-138	325-365	138-162	365-400
100	66-90	375-410	90-114	398-435	120-143	420-455	145-170	445-490
120	66-90	503-542	92-115	515-556	123-145	530-570	153-175	555-600

Antifreeze Correction

Antifreeze		Heating Capacity		Cooling Capacity		Pessure Drop
		Load	Source	Load	Source	
Type	Percent	90°F EWT	30°F EWT	45°F EWT	90°F EWT	30°F EWT
Water	0	1.000	1.000	1.000	1.000	1.000
Ethylene Glycol	10	0.991	0.973	0.975	0.991	1.075
	20	0.979	0.943	0.946	0.979	1.163
	30	0.965	0.917	0.920	0.965	1.225
	40	0.955	0.890	0.895	0.955	1.324
	50	0.943	0.865	0.870	0.943	1.419
Propylene Glycol	10	0.981	0.958	0.959	0.981	1.130
	20	0.969	0.913	0.919	0.969	1.270
	30	0.950	0.854	0.866	0.950	1.433
	40	0.937	0.813	0.829	0.937	1.614
	50	0.922	0.770	0.789	0.922	1.816
Methanol	10	0.986	0.957	0.961	0.986	1.127
	20	0.970	0.924	0.928	0.970	1.197
	30	0.951	0.895	0.897	0.951	1.235
	40	0.936	0.863	0.865	0.936	1.323
	50	0.920	0.833	0.835	0.920	1.399
Ethanol	10	0.991	0.927	0.941	0.991	1.242
	20	0.972	0.887	0.901	0.972	1.343
	30	0.947	0.856	0.866	0.947	1.383
	40	0.930	0.815	0.826	0.930	1.523
	50	0.911	0.779	0.791	0.911	1.639

= *Operation in the shaded areas should be avoided as antifreeze solutions greater than 35% will result in extreme perrformance reductions.*

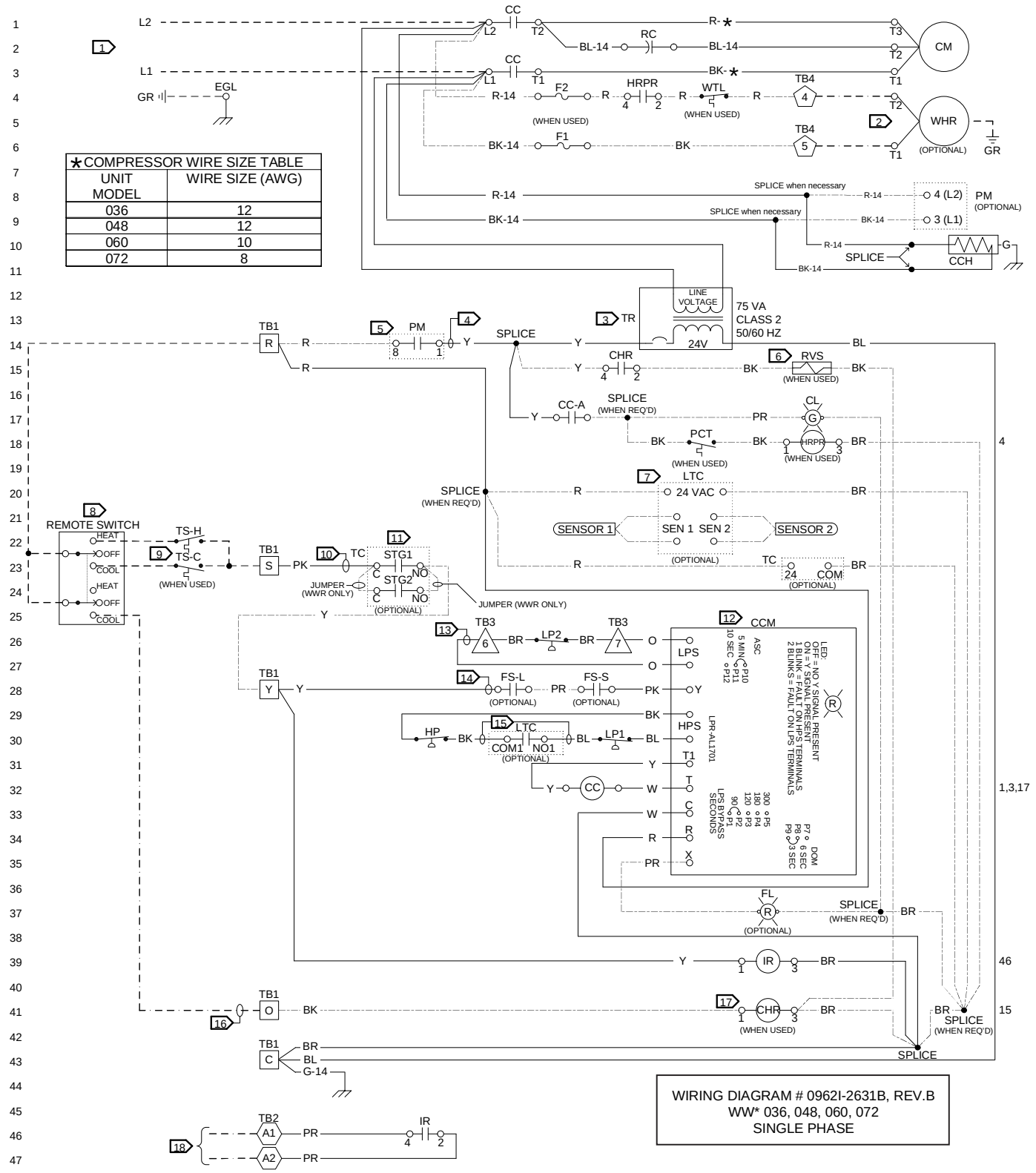
Waterflow Correction

	Flow	Heating		Cooling	
	GPM/Ton	Tons	kW	Tons	kW
Load	1.2	0.982	1.040	0.970	1.044
	1.8	0.990	1.022	0.983	1.024
	2.4	1.000	1.000	1.000	1.000
Source	1.5	0.973	1.042	0.984	1.038
	2.3	0.987	1.021	0.993	1.019
	3.0	1.000	1.000	1.000	1.000

208-230/60/1, Unit Sizes 036, 048, 060

Note: *See wiring diagram legend on page 15.*

★COMPRESSOR WIRE SIZE TABLE	
UNIT MODEL	WIRE SIZE (AWG)
036	12
048	12
060	10
072	8



Legend

208-230/60/1, Unit Sizes 036, 048, 060

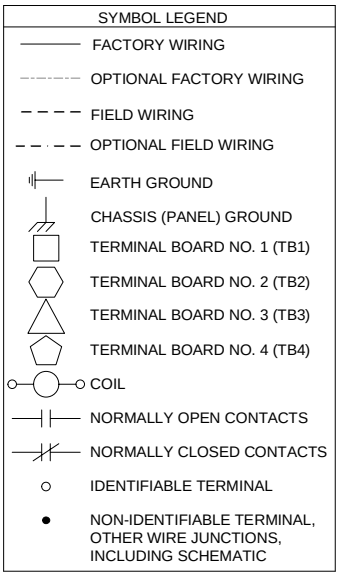
LEGEND		
FUNCTIONAL DESIGNATION	LINE NUMBER	DESCRIPTION
CL	17	OPTIONAL INDICATOR LIGHT - COMPRESSOR ON
CC	32	COMPRESSOR CONTACTOR
CCH	10	CRANKCASE HEATER
CCM	26	COMPRESSOR CONTROL MODULE
CHR	41	CHANGEOVER RELAY (WHEN USED)
CM	2	COMPRESSOR
EGL	4	EQUIPMENT GROUNDING LUG(S)
F1,F2	6,4	FUSING (WHEN USED) - SEE FUSE TABLE
FL	37	OPTIONAL INDICATOR LIGHT - FAULT
FS-L	28	OPTIONAL FLOW PROVING SWITCH – LOAD COIL
FS-S	28	OPTIONAL FLOW PROVING SWITCH – SOURCE COIL
HP	30	HIGH DISCHARGE PRESSURE CUTOUT SWITCH
HRPR	18	HEAT RECOVERY PUMP RELAY (WHEN USED)
IR	39	INTERLOCK RELAY
LP1	30	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 1
LP2	26	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 2
LTC	20,30	LOW FLUID TEMPERATURE CUTOUT MODULE
PCT	18	WASTE HEAT RECOVERY PUMP CONTROL THERMOSTAT (WHEN USED)
PM	8,14	OPTIONAL POWER MONITOR
RC	2	MOTOR RUN CAPACITOR
RVS	15	REVERSING VALVE SOLENOID (WHEN USED)
TB1	+	TERMINAL BOARD NO. 1
TB2	46,47	TERMINAL BOARD NO. 2
TB3	26	TERMINAL BOARD NO. 3
TB4	4,6	TERMINAL BOARD NO. 4 (WHEN USED)
TR	13	CONTROL TRANSFORMER
TC	23	TEMPERATURE CONTROLLER (OPTIONAL)
TS-C	23	AQUASTAT – COOLING (WHEN USED)
TS-H	22	AQUASTAT – HEATING (WHEN USED)
WHR	5	OPTIONAL WASTE HEAT RECOVERY PUMP
WTL	4	WATER TEMPERATURE LIMIT THERMOSTAT (WHEN USED)
# SEE LINE NUMBER TO THE RIGHT OF CONTACTOR COIL ON WIRING DIAGRAM.		
+ MULTIPLE LINE NUMBERS.		

WIRE COLOR LEGEND			
BK:	BLACK	PK:	PINK
BL:	BLUE	PR:	PURPLE
BR:	BROWN	R:	RED
G:	GREEN	W:	WHITE
O:	ORANGE	Y:	YELLOW

NOTES:
- NUMBER PLACED AFTER DASH FOLLOWING COLOR CODE INDICATES WIRE GAGE. FOR EXAMPLE> BK-12 IS A BLACK, 12 AWG WIRE.
- NO NUMBER AFTER COLOR CODE INDICATES 18 AWG WIRE. FOR EXAMPLE> BK IS A BLACK 18 AWG WIRE.
- ASTERISK AFTER DASH FOLLOWING COLOR CODE INDICATES REFERRAL TO COMPRESSOR WIRE SIZE TABLE.

FUSE TABLE				
FUSE NO.	CLASS	VOLTS AC	AMPERES	TIME DELAY
F1,F2	CC	600	1.5	YES

SYMBOL LEGEND



1. FIELD POWER SUPPLY PER UNIT RATING PLATE. MINIMUM CIRCUIT AMPACITY AND MAXIMUM SIZE OF TIME-DELAY FUSE OR HACR-TYPE CIRCUIT BREAKER PER UNIT RATING PLATE. PROVIDE DISCONNECTING MEANS AND EQUIPMENT GROUNDING AS REQUIRED.

2. HEAT RECOVERY OPTION:
   - FIELD INSTALLED WASTE HEAT RECOVERY PUMP WIRING. USE 14 AWG, 75C CONDUCTORS MINIMUM . COMPLY WITH LOCAL CODES WHICH MAY REQUIRE LARGER SIZE WIRING. INSTALL ADDITIONAL DISCONNECTING MEANS WHERE REQUIRED TO COMPLY WITH ELECTRICAL CODE. THIS EQUIPMENT MUST BE PERMANENTLY GROUNDED IN ACCORDANCE WITH ELECTRICAL CODE. TERMINAL BOARD "TB4" IS RATED FOR BOTH 14 AND 12 AWG WIRE SIZES.
   - THE FOLLOWING COMPONENTS ARE USED ONLY WHEN WASTE HEAT RECOVERY (DESUPERHEATER) OPTION IS FURNISHED: "F1", "F2", "HRPR", "PCT", "TB4", "WHR", AND "WTL". "WHR" IS ORDERED SEPARATELY FOR FIELD INSTALLATION.

3. TRANSFORMER MAY HAVE TAPS FOR 120V, 208V, 240V, OR 480V SYSTEM POWER SUPPLY. BEFORE APPLYING POWER TO THE UNIT, ENSURE TRANSFORMER IS WIRED FOR APPROPRIATE SYSTEM POWER SUPPLY. INSULATE SEPARATELY ANY UNUSED LEADS. POLARITY IS NOT INDICATED. TYPICAL TRANSFORMER SHOWN. SEE TRANSFORMER LABEL FOR LEAD COLOR CODING.

4. WHEN "PM" IS NOT USED, THIS WIRE CONNECTS DIRECTLY TO TERMINAL R ON "TB1".

5. IF POWER MONITOR OUTPUT CONTACTS DO NOT TRANSFER WHEN POWER IS APPLIED TO UNIT (BICOLOR LED GLOWS GREEN UNDER NORMAL CONDITIONS AND RED DURING FAULT CONDITIONS):
   1. VERIFY THAT ALL THREE PHASES ARE PRESENT AND ARE OF THE CORRECT VOLTAGE. IF ALL THREE PHASES ARE PRESENT AND ARE OF THE CORRECT VOLTAGE, PHASE ROTATION MAY BE INCORRECT. PERFORM STEP 2.
   2. DISCONNECT POWER TO THE WW* UNIT. VERIFY THAT POWER IS IN FACT DISCONNECTED. SWAP ANY TWO OF THE THREE UNIT POWER SUPPLY WIRES. WHEN POWER IS REAPPLIED, OUTPUT CONTACTS SHOULD NOW TRANSFER.

6. "RVS" IS USED ONLY WITH WWR MODELS AND IS ENERGIZED IN COOLING MODE (LOAD COIL IS HEAT SOURCE, SOURCE COIL IS HEAT SINK).
   "RVS" IS NOT USED WITH WWC AND WWH MODELS.

7. SEE FIGURE 1 ON SHEET 3 OF THIS DRAWING FOR BOARD LAYOUT, SENSOR LOCATIONS, TEMPERATURE SETTING NOTE, AND SENSOR RESISTANCE VERSUS TEMPERATURE GRAPH.

8. TYPICAL FIELD CONTROL WIRING SHOWN. ACTUAL FIELD WIRING MAY DIFFER FROM WIRING SHOWN HERE. USE 18 AWG MINIMUM FOR FIELD 24 VOLT CONTROL WIRING. TYPICAL REMOTE SWITCH SHOWN. REMOTE SWITCH MAY BE SUPPLIED BY OTHERS OR IS AVAILABLE AS AN OPTIONAL ACCESSORY FROM THE FACTORY. MINIMUM PILOT DUTY RATING OF EACH POLE OF REMOTE SWITCH IS 24 VOLT-AMPERES @ 24 VOLTS AC WHEN CONNECTED AS SHOWN.

9. AQUASTATS "TS-H" AND "TS-C" ARE NOT USED WHEN OPTIONAL FACTORY INSTALLED TEMPERATURE CONTROLLER "TC" IS FURNISHED. TYPICAL AQUASTATS SHOWN. AQUASTATS MAY BE SUPPLIED BY OTHERS OR ARE AVAILABLE AS AN OPTIONAL ACCESSORY FROM THE FACTORY. MINIMUM PILOT DUTY RATING OF EACH POLE OF AQUASTAT IS 24 VOLT-AMPERES @ 24 VOLTS AC WHEN CONNECTED AS SHOWN.

10. THIS WIRE CONNECTS DIRECTLY FROM TERMINAL S TO TERMINAL Y ON "TB1" WHEN OPTIONAL TEMPERATURE CONTROLLER "TC" IS NOT FURNISHED.

11. WHEN OPTIONAL TEMPERATURE CONTROLLER "TC" IS FURNISHED, INSTALLER MUST PROGRAM CONTROLLER. REFER TO TEMPERATURE CONTROL INSTALLATION INSTRUCTIONS.
    WITH REVERSE-CYCLE WWR UNITS, PROGRAM CONTROLLER AS ONE STAGE COOLING AND ONE STAGE HEATING. STAGE 1 IS THE COOLING STAGE AND STAGE 2 IS THE HEATING STAGE.
    INSTALL SENSOR @ WATER INLET PIPE (LOAD).

12. SEE FIGURE 2 ON SHEET 3 OF THIS DRAWING FOR COMPRESSOR CONTROL MODULE OPERATION.

13. WIRED AS SHOWN FOR OPEN LOOP OR HIGH TEMPERATURE CLOSED LOOP APPLICATIONS. FOR LOW TEMPERATURE CLOSED LOOP APPLICATIONS, MOVE THIS WIRE FROM TERMINAL 6 TO TERMINAL 7 ON "TB3".

14. WHEN "FS-L" AND "FS-S" ARE NOT USED, THIS WIRE CONNECTS DIRECTLY TO TERMINAL Y OF "CCM".

15. WHEN OPTIONAL "LTC" IS NOT USED, THESE TWO WIRES ARE SPLICED TOGETHER.

16. CONDUCTOR "O" REQUIRED WITH WWR REVERSE CYCLE UNITS.
    CONDUCTOR "O" NOT USED WITH WWC COOLING AND WWR HEATING UNITS.

17. "CHR" IS USED ONLY WITH "WWR" UNITS.
    "CHR" IS NOT USED WITH "WWC" AND "WWH" UNITS.

18. INTERLOCK RELAY CONTACTS ARE PROVIDED TO OPERATE AN EXTERNAL PILOT DUTY LOAD (SUCH AS A PUMP RELAY COIL) WITH A CALL FOR COMPRESSOR.
    - AN EXTERNAL LOAD POWERED BY TRANSFORMER "TR" IN THE WW* UNIT MUST NOT EXCEED 12 VA SEALED (96 VA INRUSH) @ 24 VOLTS AC.
    - EXTERNAL LOADS POWERED FROM AN EXTERNAL SOURCE ARE LIMITED TO CLASS 2 CIRCUITS ONLY (30 VOLTS AC MAXIMUM). EXTERNAL LOAD CHARACTERISTICS MUST NOT EXCEED 10 AMPS MAKE, 1 AMP BREAK. **MAINTAIN SEPARATION BETWEEN CLASS 2 CIRCUITS OF DIFFERENT SOURCES.**
    - PROVIDE DISCONNECTING MEANS, EQUIPMENT GROUNDING, AND OVERCURRENT PROTECTION AS REQUIRED.

WIRING DIAGRAM # 0962I-2631B, REV.B
WW* 036, 048, 060, 072
SINGLE PHASE

Optional Low Temperature Control Board "LTC" – 208-230/60/1, Unit Sizes 036, 048, 060

The control board is powered by 24 volts AC, 50/60 hertz which is applied to the 24 VAC terminals. The control will energize the output relays (COM 1 makes connection with NO 1 and COM 2 makes connection with NO 2), only if the temperatures of both Sensor 1 and Sensor 2 are above the selected temperature which is 20°F or 35°F.

Note: *Always disconnect power to WW* unit before moving jumpers.*

While the output relays are energized, the control keeps monitoring Sensor 1 and Sensor 2 to make sure that the temperature of the sensors is always above the selected temperture, the control will de-energize both ouput relays until the temperature of the sensor is 2.5 degrees above the selected temperature. For example, you set the temperature to 20°F. The output relays will de-energize when the sensor temperature drops below 20°F. The control will re-energize the output relays when the sensor temperature rises above 22.5°F. Additionally, the control will monitor each individual sensor to make sure it isn't broken or shorted. If either Sensor 1 or Sensor 2 fails short or open before or during operation, the control will de-energize both output relays until the sensor is repaired or replaced.

Table 6: LTC board sensor locations

Model	Sensor 1	Sensor 2
WCA	Liquid Out - Load Coil	Liquid Out - Source Coil
WHA	Liquid Out - Load Coil	Liquid Out - Source Coil
WRA	Liquid Out - Load Coil	Liquid Out - Source Coil

Figure 1: "LTC" board jumper settings

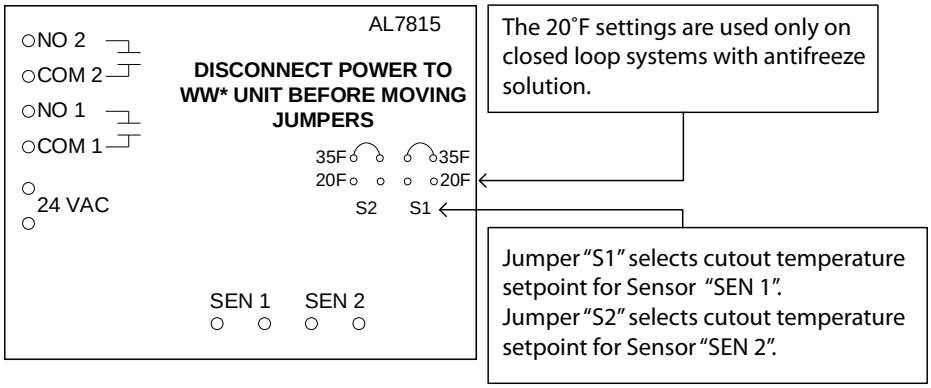
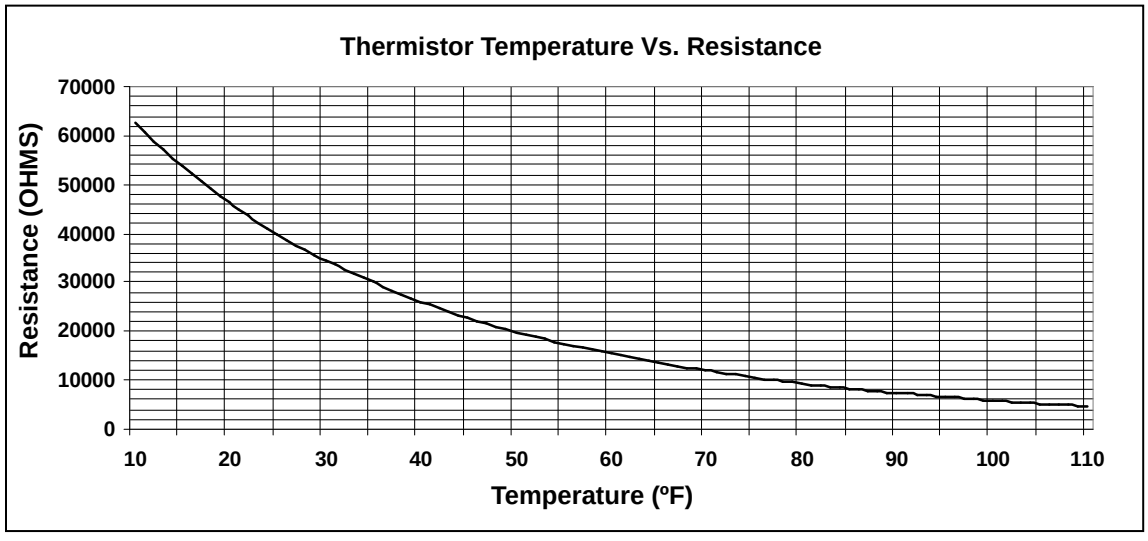


Figure 2: Thermistor temperature vs. resistance graph



Compressor Control Module Functional Operation 208-230/60/1, Unit Sizes 036, 048, 060

Power:

For proper operation there must always be 18 to 30 volts AC present at the R and C terminals.

Time Delays:

1. **Anti-short cycle:** provides the compressor with short cycle protection for a selectable time of 10 seconds (for servicing only) or 5 minutes (normal operational-setting). This feature is enabled upon power loss to the circuit board, loss of the Y signal, or the opening of a switch connected to the HPS or LPS terminals. If the selecto shunt is not in place, the circuit will default to a 5 minute anti short-cycle delay.
2. **Delay on make:** Delays the turning on of the compressor contactor for a selectable time of 3 or 6 seconds every time the Y signal coalls. If the selector shunit is not in place, the circuit will default to a 6 second delay on make.
3. **Low Pressure Bypass:** Allows time for the low side pressure to build up enough pressure at start up for the 60 psig low pressure switch to close. The circuit will offer a selectable timing range of 90, 120, 180, or 300 seconds. This time delay will start upon a Y call from the thermostat. Should the 60 psig low pressure switch still be open after the selected delay expires, the compressor will de-energize and the alarm will energize. This will be defined as an LPS fault, (factory set for 90 seconds). If necessary to increase the delay, select the smallest amount of bypass time delay that allows the compressor to start and operate.

Note: *The 60 psig low pressure switch is jumpered out in low temperature closed loop system applications using antifreeze solution.*
Also note tht the 35 psig low pressure switch is connected in series with the high pressure switch to the HPS terminals and is never bypassed.

Operation Of The HPS Terminals

Switches connected to the HPS terminals are connected in series with the Y signal through the circuit board. These switches are also connected in series witht the T1 output in order to provide an immediate response if a switch were to open. If a switch conncecte to the HPS terminal should open, the status LED will blink once.

Operation Of The LPS Terminals

The 60 psig low pressure switch (brown leads) is connected to the LPS terminals in series with the Y signal through the circuit board. The 60 psig low pressure switch is connected in series with the Y signal to the processor only. This will allow the control to monitor the low pressure switch status and initiate the bypass delay. If the 60 psig low pressure switch should open, the status LED will blink twice.

Normal Cycle

A normal cycle will begin with 24 VAC applied to the R and C terminals on the circuit board. Once the control is powered up, the processor will read the Y signal to determine if it is calling. If it is calling and the switches connected to the HPS terminals are closed, the delay on make and low pressure bypass timers will initiate.

If a switch connected to the HPS terminals is open, the control will enter the lockout mode. After the delay on make time expires, the compressor contactor will energize. It will remain energized as the low pressure bypass timer counts down.

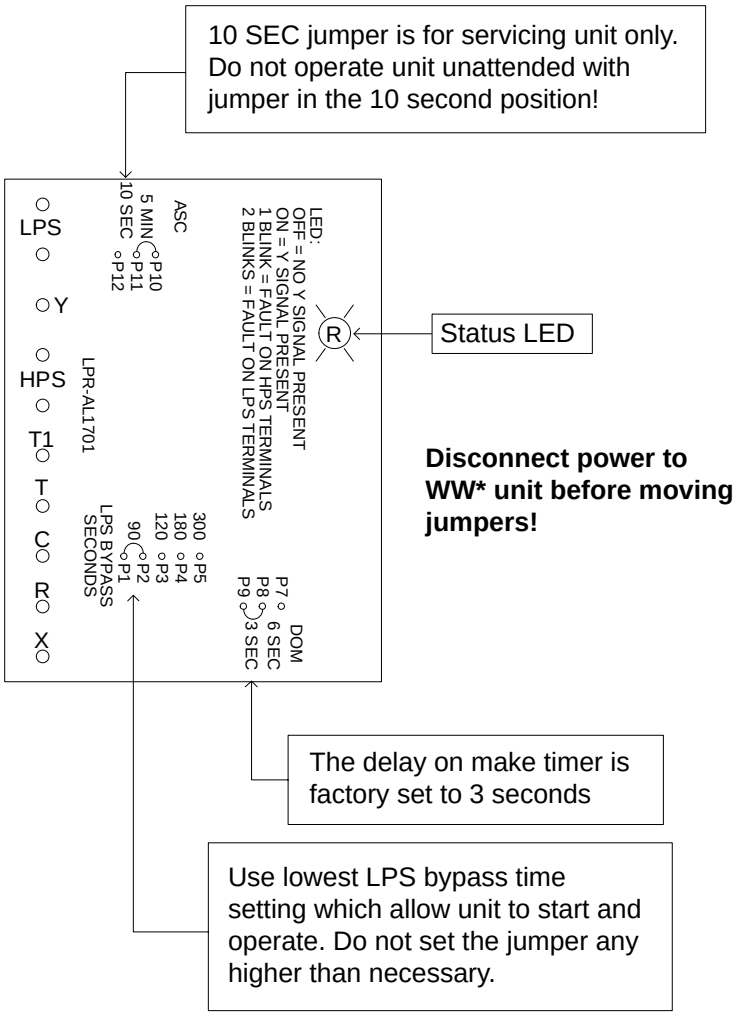
If the 60 psig low pressure switch is closed after the timer expires, the compressor will remain energized. If it is still open, the control will enter the lockout mode.

If power is lost, or the Y signal is removed, or an HPS or LPS terminal switch fault is detected while the compressor contactor is energized, the unit will initiate the anti short-cycle delay.

Alarm/Lockout

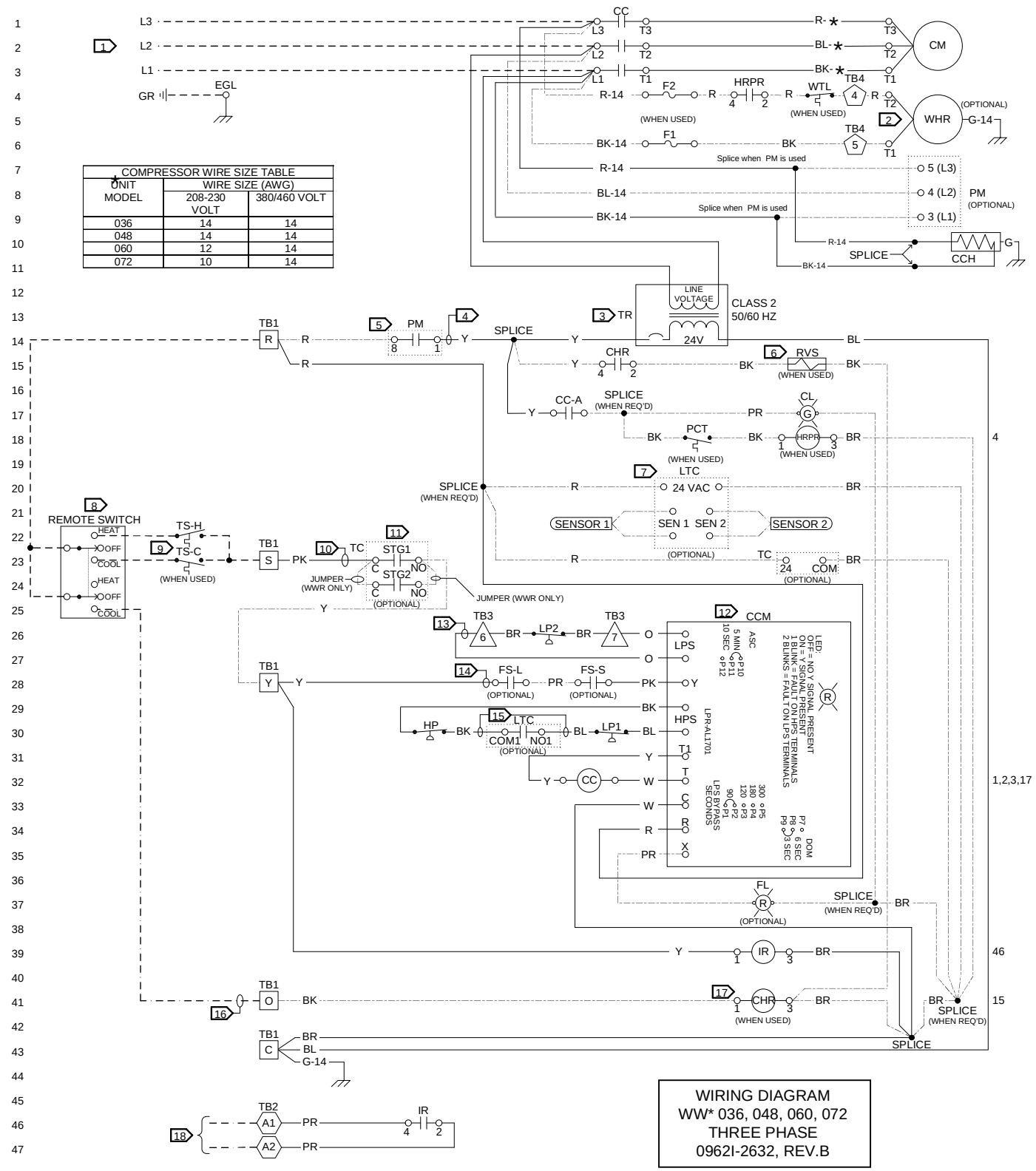
The alarm terminal will output the R signal and will only be energized as a result of an HPS or LPS fault. An HPS fault is defined as the opening of a switch connected to the HPS terminals for any amount of time. An LPS fault is defined as the 60 psig low pressure switch open after the bypass time. If any of these conditions are true, the unit will de-energize the compressor and energize the alarm. This will be defined as a lockout condition. To reset a lockout condition, the pressure fault must be corrected and the Y signal from the thermostat must be cycled.

Figure 3: Compressor control module functional operation



208-230/60/3, Unit Sizes 036, 048, 060 and 072

Note: *See wiring diagram legend on page 20.*



COMPRESSOR WIRE SIZE TABLE		
UNIT MODEL	WIRE SIZE (AWG)	
	208-230 VOLT	380/460 VOLT
036	14	14
048	14	14
060	12	14
072	10	14

WIRING DIAGRAM
WW* 036, 048, 060, 072
THREE PHASE
0962I-2632, REV.B

Legend

208-230/60/3, Unit Sizes 036, 048, 060 and 072

LEGEND		
FUNCTIONAL DESIGNATION	LINE NUMBER	DESCRIPTION
CL	17	OPTIONAL INDICATOR LIGHT - COMPRESSOR ON
CC	32	COMPRESSOR CONTACTOR
CCH	10	CRANKCASE HEATER
CCM	26	COMPRESSOR CONTROL MODULE
CHR	41	CHANGEOVER RELAY (WHEN USED)
CM	2	COMPRESSOR
EGL	4	EQUIPMENT GROUNDING LUG(S)
F1,F2	6,4	FUSING (WHEN USED) - SEE FUSE TABLE
FL	37	OPTIONAL INDICATOR LIGHT - FAULT
FS-L	28	OPTIONAL FLOW PROVING SWITCH – LOAD COIL
FS-S	28	OPTIONAL FLOW PROVING SWITCH – SOURCE COIL
HP	30	HIGH DISCHARGE PRESSURE CUTOUT SWITCH
HRPR	18	HEAT RECOVERY PUMP RELAY (WHEN USED)
IR	39	INTERLOCK RELAY
LP1	30	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 1
LP2	26	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 2
LTC	20,30	LOW FLUID TEMPERATURE CUTOUT MODULE
PCT	18	WASTE HEAT RECOVERY PUMP CONTROL THERMOSTAT (WHEN USED)
PM	8,14	OPTIONAL POWER MONITOR
RVS	15	REVERSING VALVE SOLENOID (WHEN USED)
TB1	+	TERMINAL BOARD NO. 1
TB2	46,47	TERMINAL BOARD NO. 2
TB3	26	TERMINAL BOARD NO. 3
TB4	4,6	TERMINAL BOARD NO. 4
TR	13	CONTROL TRANSFORMER
TC	23	TEMPERATURE CONTROLLER (OPTIONAL)
TS-C	23	AQUASTAT – COOLING (WHEN USED)
TS-H	22	AQUASTAT – HEATING (WHEN USED)
WHR	5	OPTIONAL WASTE HEAT RECOVERY PUMP
WTL	4	WATER TEMPERATURE LIMIT THERMOSTAT (WHEN USED)

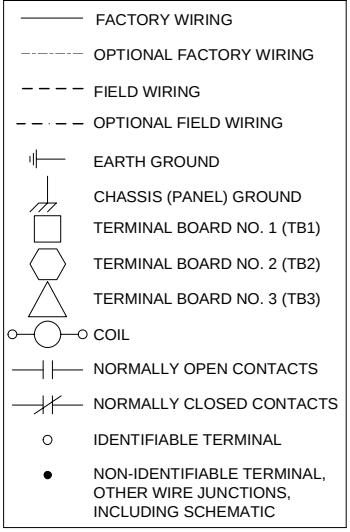
SEE LINE NUMBER TO THE RIGHT OF CONTACTOR COIL ON WIRING DIAGRAM.
+ MULTIPLE LINE NUMBERS.

WIRE COLOR LEGEND			
BK:	BLACK	PK:	PINK
BL:	BLUE	PR:	PURPLE
BR:	BROWN	R:	RED
G:	GREEN	W:	WHITE
O:	ORANGE	Y:	YELLOW

NOTES:
- ✥ NUMBER PLACED AFTER DASH FOLLOWING COLOR CODE INDICATES WIRE GAGE. FOR EXAMPLE> BK-12 IS A BLACK, 12 AWG WIRE.
- ✥ NO NUMBER AFTER COLOR CODE INDICATES 18 AWG WIRE. FOR EXAMPLE> BK IS A BLACK 18 AWG WIRE.
- ✥ ASTERISK AFTER DASH FOLLOWING COLOR CODE INDICATES REFERRAL TO COMPRESSOR WIRE SIZE TABLE.

FUSE TABLE				
FUSE NO.	CLASS	VOLTS AC	AMPERES	TIME DELAY
F1,F2	+	250	1	NO
+ SUPPLEMENTARY TYPE; USE FERRAZ SHAWMUT CATALOG NO. OTM 1.				

SYMBOL LEGEND



1. FIELD POWER SUPPLY PER UNIT RATING PLATE. MINIMUM CIRCUIT AMPACITY AND MAXIMUM SIZE OF TIME-DELAY FUSE OR HACR-TYPE CIRCUIT BREAKER PER UNIT RATING PLATE. PROVIDE DISCONNECTING MEANS AND EQUIPMENT GROUNDING AS REQUIRED.

2. THE FOLLOWING COMPONENTS ARE USED ONLY WHEN WASTE HEAT RECOVERY (DESUPERHEATER) OPTION IS FURNISHED: "F1", "F2", "HRPR", "PCT", "WHR", AND "WTL".

3. TRANSFORMER MAY HAVE TAPS FOR 120V, 208V, 240V, OR 480V SYSTEM POWER SUPPLY. BEFORE APPLYING POWER TO THE UNIT, ENSURE TRANSFORMER IS WIRED FOR APPROPRIATE SYSTEM POWER SUPPLY. INSULATE SEPARATELY ANY UNUSED LEADS. POLARITY IS NOT INDICATED. TYPICAL TRANSFORMER SHOWN. SEE TRANSFORMER LABEL FOR LEAD COLOR CODING.

4. WHEN "PM" IS NOT USED, THIS WIRE CONNECTS DIRECTLY TO TERMINAL R ON "TB1".

5. IF POWER MONITOR OUTPUT CONTACTS DO NOT TRANSFER WHEN POWER IS APPLIED TO UNIT (BICOLOR LED GLOWS GREEN UNDER NORMAL CONDITIONS AND RED DURING FAULT CONDITIONS):
   1. VERIFY THAT ALL THREE PHASES ARE PRESENT AND ARE OF THE CORRECT VOLTAGE. IF ALL THREE PHASES ARE PRESENT AND ARE OF THE CORRECT VOLTAGE, PHASE ROTATION MAY BE INCORRECT. PERFORM STEP 2.
   2. DISCONNECT POWER TO THE WW* UNIT. VERIFY THAT POWER IS IN FACT DISCONNECTED. SWAP ANY TWO OF THE THREE UNIT POWER SUPPLY WIRES. WHEN POWER IS REAPPLIED, OUTPUT CONTACTS SHOULD NOW TRANSFER.

6. "RVS" IS USED ONLY WITH WWR MODELS AND IS ENERGIZED IN COOLING MODE (LOAD COIL IS HEAT SOURCE, SOURCE COIL IS HEAT SINK).
   "RVS" IS NOT USED WITH WWC AND WWH MODELS.

7. SEE FIGURE 1 ON SHEET 2 OF THIS DRAWING FOR BOARD LAYOUT, SENSOR LOCATIONS, TEMPERATURE SETTING NOTE, AND SENSOR RESISTANCE VERSUS TEMPERATURE GRAPH.

8. TYPICAL FIELD CONTROL WIRING SHOWN. ACTUAL FIELD WIRING MAY DIFFER FROM WIRING SHOWN HERE. USE 18 AWG MINIMUM FOR FIELD 24 VOLT CONTROL WIRING. TYPICAL REMOTE SWITCH SHOWN. REMOTE SWITCH MAY BE SUPPLIED BY OTHERS OR IS AVAILABLE AS AN OPTIONAL ACCESSORY FROM THE FACTORY. MINIMUM PILOT DUTY RATING OF EACH POLE OF REMOTE SWITCH IS 24 VOLT-AMPERES @ 24 VOLTS AC WHEN CONNECTED AS SHOWN.

9. AQUASTATS "TS-H" AND "TS-C" ARE NOT USED WHEN OPTIONAL FACTORY INSTALLED TEMPERATURE CONTROLLER "TC" IS FURNISHED. TYPICAL AQUASTATS SHOWN. AQUASTATS MAY BE SUPPLIED BY OTHERS OR ARE AVAILABLE AS AN OPTIONAL ACCESSORY FROM THE FACTORY. MINIMUM PILOT DUTY RATING OF EACH POLE OF AQUASTAT IS 24 VOLT-AMPERES @ 24 VOLTS AC WHEN CONNECTED AS SHOWN.

10. THIS WIRE CONNECTS DIRECTLY FROM TERMINAL S TO TERMINAL Y ON "TB1" WHEN OPTIONAL TEMPERATURE CONTROLLER "TC" IS NOT FURNISHED.

11. WHEN OPTIONAL TEMPERATURE CONTROLLER "TC" IS FURNISHED, INSTALLER MUST PROGRAM CONTROLLER. REFER TO TEMPERATURE CONTROL INSTALLATION INSTRUCTIONS.
    WITH REVERSE-CYCLE WWR UNITS, PROGRAM CONTROLLER AS ONE STAGE COOLING AND ONE STAGE HEATING. STAGE 1 IS THE COOLING STAGE AND STAGE 2 IS THE HEATING STAGE.
    INSTALL SENSOR @ WATER INLET PIPE (LOAD COIL).

12. SEE FIGURE 2 ON SHEET 3 OF THIS DRAWING FOR COMPRESSOR CONTROL MODULE OPERATION.

13. WIRED AS SHOWN FOR OPEN LOOP OR HIGH TEMPERATURE CLOSED LOOP APPLICATIONS. FOR LOW TEMPERATURE CLOSED LOOP APPLICATIONS, MOVE THIS WIRE FROM TERMINAL 6 TO TERMINAL 7 ON "TB3".

14. WHEN "FS-L" AND "FS-S" ARE NOT USED, THIS WIRE CONNECTS DIRECTLY TO TERMINAL Y OF "CCM".

15. WHEN OPTIONAL "LTC" IS NOT USED, THESE TWO WIRES ARE SPLICED TOGETHER.

16. CONDUCTOR "O" REQUIRED WITH WWR REVERSE CYCLE UNITS.
    CONDUCTOR "O" NOT USED WITH WWC COOLING AND WWR HEATING UNITS.

17. "CHR" IS USED ONLY WITH "WWR" UNITS.
    "CHR" IS NOT USED WITH "WWC" AND "WWH" UNITS.

18. INTERLOCK RELAY CONTACTS ARE PROVIDED TO OPERATE AN EXTERNAL PILOT DUTY LOAD (SUCH AS A PUMP RELAY COIL) WITH THE COMPRESSORS.
    - ✥ AN EXTERNAL LOAD POWERED BY TRANSFORMER "TR" IN THE WW* UNIT MUST NOT EXCEED 12 VA SEALED (96 VA INRUSH) @ 24 VOLTS AC.
    - ✥ EXTERNAL LOADS POWERED FROM AN EXTERNAL SOURCE ARE LIMITED TO CLASS 2 CIRCUITS ONLY (30 VOLTS AC MAXIMUM). EXTERNAL LOAD CHARACTERISTICS MUST NOT EXCEED 10 AMPS MAKE, 1 AMP BREAK. **MAINTAIN SEPARATION BETWEEN CLASS 2 CIRCUITS OF DIFFERENT SOURCES.**
    - ✥ PROVIDE DISCONNECTING MEANS, EQUIPMENT GROUNDING, AND OVERCURRENT PROTECTION AS REQUIRED.

WIRING DIAGRAM
WW* 036, 048, 060, 072
THREE PHASE
0962I-2632, REV.B

Optional Low Temperature Control Board "LTC" – 208-230/60/3, Unit Sizes 036, 048, 060 and 072

The control board is powered by 24 volts AC, 50/60 hertz which is applied to the 24 VAC terminals. The control will energize the output relays (COM 1 makes connection with NO 1 and COM 2 makes connection with NO 2), only if the temperatures of both Sensor 1 and Sensor 2 are above the selected temperature which is 20°F or 35°F.

Note: *Always disconnect power to WW* unit before moving jumpers.*

While the output relays are energized, the control keeps monitoring Sensor 1 and Sensor 2 to make sure that the temperature of the sensors is always above the selected temperture, the control will de-energize both ouput relays until the temperature of the sensor is 2.5 degrees above the selected temperature. For example, you set the temperature to 20°F. The output relays will de-energize when the sensor temperature drops below 20°F. The control will re-energize the output relays when the sensor temperature rises above 22.5°F. Additionally, the control will monitor each individual sensor to make sure it isn't broken or shorted. If either Sensor 1 or Sensor 2 fails short or open before or during operation, the control will de-energize both output relays until the sensor is repaired or replaced.

Table 7: LTC board sensor locations

Model	Sensor 1	Sensor 2
WCA	Liquid Out - Load Coil	Liquid Out - Source Coil
WHA	Liquid Out - Load Coil	Liquid Out - Source Coil
WRA	Liquid Out - Load Coil	Liquid Out - Source Coil

Figure 4: "LTC" board jumper settings

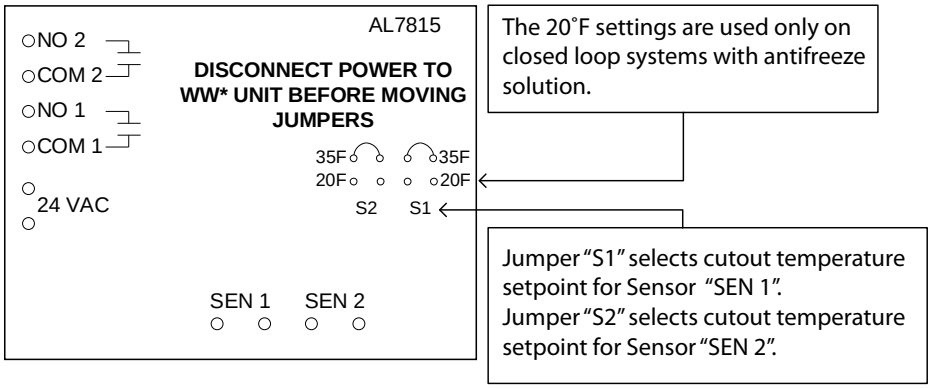
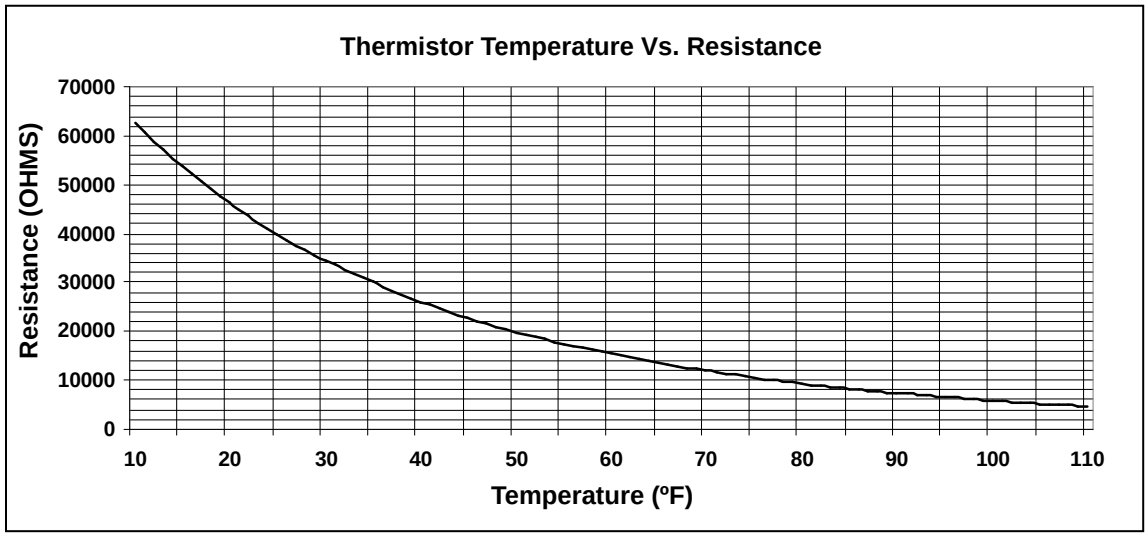


Figure 5: Thermistor temperature vs. resistance graph



Compressor Control Module Functional Operation – 208-230/60/3, Unit Sizes 036, 048, 060 and 072

Power:

For proper operation there must always be 18 to 30 volts AC present at the R and C terminals.

Time Delays:

1. **Anti-short cycle:** provides the compressor with short cycle protection for a selectable time of 10 seconds (for servicing only) or 5 minutes (normal operationalsetting). This feature is enabled upon power loss to the circuit board, loss of the Y signal, or the opening of a switch connected to the HPS or LPS terminals. If the selecto shunt is not in place, the circuit will default to a 5 minute anti short-cycle delay.
2. **Delay on make:** Delays the turning on of the compressor contactor for a selectable time of 3 or 6 seconds every time the Y signal coalls. If the selector shunit is not in place, the circuit will default to a 6 second delay on make.
3. **Low Pressure Bypass:** Allows time for the low side pressure to build up enough pressure at start up for the 60 psig low pressure switch to close. The circuit will offer a selectable timing range of 90, 120, 180, or 300 seconds. This time delay will start upon a Y call from the thermostat. Should the 60 psig low pressure switch still be open after the selected delay expires, the compressor will de-energize and the alarm will energize. This will be defined as an LPS fault, (factory set for 90 seconds). If necessary to increase the delay, select the smallest amount of bypass time delay that allows the compressor to start and operate.

Note: *The 60 psig low pressure switch is jumpered out in low temperature closed loop system applications using antifreeze solution.*
Also note tht the 35 psig low pressure switch is connected in series with the high pressure switch to the HPS terminals and is never bypassed.

Operation Of The HPS Terminals

Switches connected to the HPS terminals are connected in series with the Y signal through the circuit board. These switches are also connected in series witht the T1 output in order to provide an immediate response if a switch were to open. If a switch conncecte to the HPS terminal should open, the status LED will blink once.

Operation Of The LPS Terminals

The 60 psig low pressure switch (brown leads) is connected to the LPS terminals in series with the Y signal through the circuit board. The 60 psig low pressure switch is connected in series with the Y signal to the processor only. This will allow the control to monitor the low pressure switch status and initiate the bypass delay. If the 60 psig low pressure switch should open, the status LED will blink twice.

Normal Cycle

A normal cycle will begin with 24 VAC applied to the R and C terminals on the circuit board. Once the control is powered up, the processor will read the Y signal to determine if it is calling. If it is calling and the switches connected to the HPS terminals are closed, the delay on make and low pressure bypass timers will initiate.

If a switch connected to the HPS terminals is open, the control will enter the lockout mode. After the delay on make time expires, the compressor contactor will energize. It will remain energized as the low pressure bypass timer counts down.

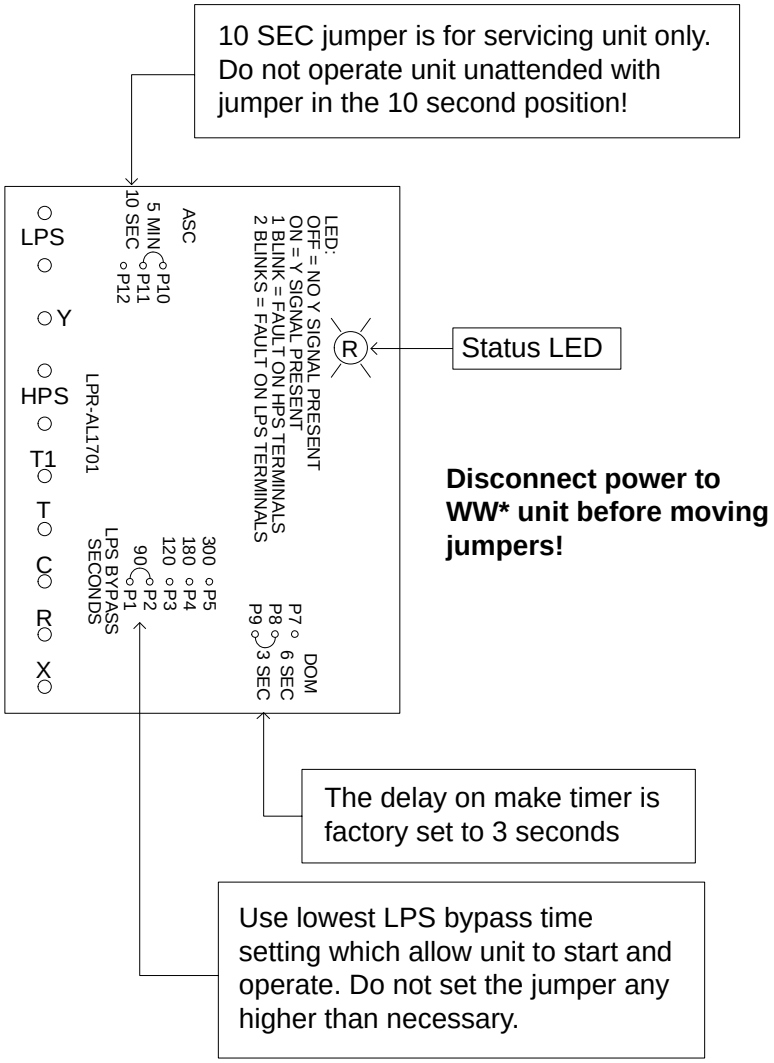
If the 60 psig low pressure switch is closed after the timer expires, the compressor will remain energized. If it is still open, the control will enter the lockout mode.

If power is lost, or the Y signal is removed, or an HPS or LPS terminal switch fault is detected while the compressor contactor is energized, the unit will initiate the anti short-cycle delay.

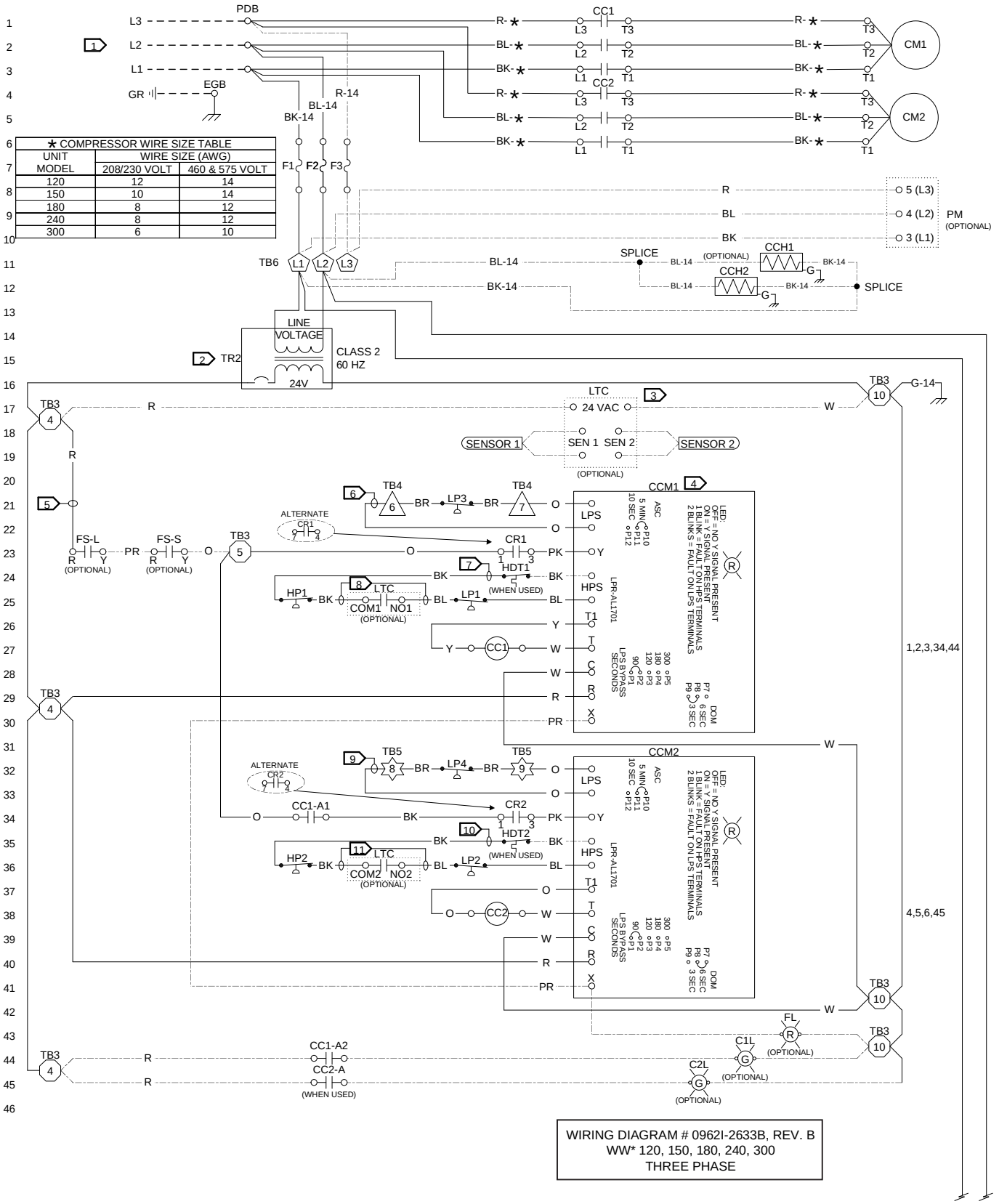
Alarm/Lockout

The alarm terminal will output the R signal and will only be energized as a result of an HPS or LPS fault. An HPS fault is defined as the opening of a switch connected to the HPS terminals for any amount of time. An LPS fault is defined as the 60 psig low pressure switch open after the bypass time. If any of these conditions are true, the unit will de-energize the compressor and energize the alarm. This will be defined as a lockout condition. To reset a lockout condition, the pressure fault must be corrected and the Y signal from the thermostat must be cycled.

Figure 6: Compressor control module functional operation



208-230/60/3, Unit Sizes 120, 150, 180, 240 and 300



✱ COMPRESSOR WIRE SIZE TABLE		
UNIT MODEL	WIRE SIZE (AWG)	
	208/230 VOLT	460 & 575 VOLT
120	12	14
150	10	14
180	8	12
240	8	12
300	6	10

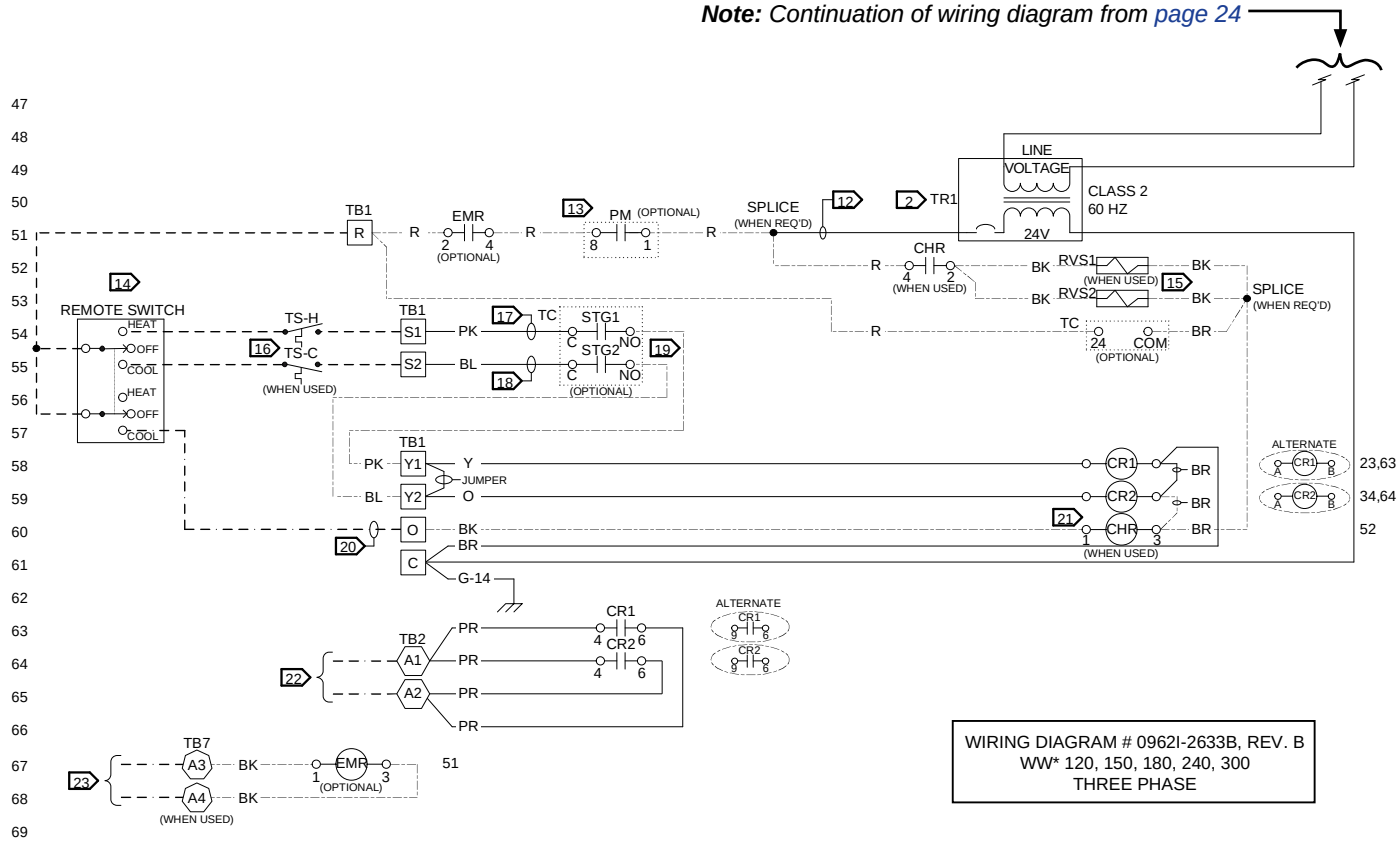
WIRING DIAGRAM # 0962I-2633B, REV. B
WW* 120, 150, 180, 240, 300
THREE PHASE

Note: *See continuation of wiring diagram on page 25*

Note: *See wiring diagram legend on page 26.*

(Continued) 208-230/60/3, Unit Sizes 120, 150, 180, 240 and 300

Note: *Continuation of wiring diagram from page 24*



Note: *See wiring diagram legend on page 26.*

Legend

208-230/60/3, Unit Sizes 120, 150, 180, 240 and 300

LEGEND		
FUNCTIONAL DESIGNATION	LINE NUMBER	DESCRIPTION
C1L	44	OPTIONAL INDICATOR LIGHT - COMPRESSOR 1 ON
C2L	45	OPTIONAL INDICATOR LIGHT - COMPRESSOR 2 ON
CC1	27	COMPRESSOR NO. 1 CONTACTOR
CC1-A1	#	"CC1" AUXILIARY CONTACT NO. 1
CC1-A2	#	"CC1" AUXILIARY CONTACT NO. 2 (WHEN USED)
CC2	38	COMPRESSOR NO. 2 CONTACTOR
CC2-A	#	"CC" AUXILIARY CONTACT (WHEN USED)
CCH,CCH2	11,12	CRANKCASE HEATER NO. 1 & NO. 2
CCM1	21	COMPRESSOR CONTROL MODULE NO. 1
CCM2	32	COMPRESSOR CONTROL MODULE NO. 2
CHR	60	CHANGEOVER RELAY (WHEN USED)
CM1	2	COMPRESSOR NO. 1
CM2	5	COMPRESSOR NO. 2
CR1	58	COMPRESSOR NO. 1 PILOT RELAY
CR2	59	COMPRESSOR NO. 2 PILOT RELAY
EGB	4	EQUIPMENT GROUNDING BAR
EMR	67	OPTIONAL ENERGY MANAGEMENT RELAY
F1,F2,F3	7	FUSING - SEE FUSE TABLE
FL	43	OPTIONAL INDICATOR LIGHT - FAULT
FS-L	23	OPTIONAL FLOW PROVING SWITCH – LOAD COIL
FS-S	23	OPTIONAL FLOW PROVING SWITCH – SOURCE COIL
HDT1	24	HIGH DISCHARGE TEMPERATURE CUTOUT NO. 1
HDT2	35	HIGH DISCHARGE TEMPERATURE CUTOUT NO. 2
HP1	25	HIGH DISCHARGE PRESSURE CUTOUT SWITCH NO. 1
HP2	36	HIGH DISCHARGE PRESSURE CUTOUT SWITCH NO. 2
LP1	25	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 1 (CKT 1)
LP2	36	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 2 (CKT 2)
LP3	21	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 3 (CKT 1)
LP4	32	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 4 (CKT 2)
LTC	17,25,36	LOW FLUID TEMPERATURE CUTOUT MODULE
PDB	1,2,3	POWER DISTRIBUTION BLOCK
PM	9,51	OPTIONAL POWER MONITOR
RVS1	52	REVERSING VALVE SOLENOID CKT 1 (WHEN USED)
RVS2	53	REVERSING VALVE SOLENOID CKT 2 (WHEN USED)
TB1	+	TERMINAL BOARD NO. 1
TB2	64,65	TERMINAL BOARD NO. 2
TB3	+	TERMINAL BOARD NO. 3
TB4	21	TERMINAL BOARD NO. 4
TB5	32	TERMINAL BOARD NO. 5
TB6	11	TERMINAL BOARD NO. 6
TB7	67,68	TERMINAL BOARD NO. 7 (WHEN USED)
TR1	50	CONTROL TRANSFORMER NO. 1
TR2	15	CONTROL TRANSFORMER NO. 2
TC	54,54	TEMPERATURE CONTROLLER (OPTIONAL)
TS-C	55	AQUASTAT – COOLING (WHEN USED)
TS-H	54	AQUASTAT – HEATING (WHEN USED)

SEE LINE NUMBER TO THE RIGHT OF CONTACTOR COIL ON WIRING DIAGRAM.
+ MULTIPLE LINE NUMBERS.

WIRE COLOR LEGEND	
BK: BLACK	PK: PINK
BL: BLUE	PR (V): PURPLE (VIOLET)
BR: BROWN	R: RED
G: GREEN	W: WHITE
GY: GRAY	Y: YELLOW
O: ORANGE	

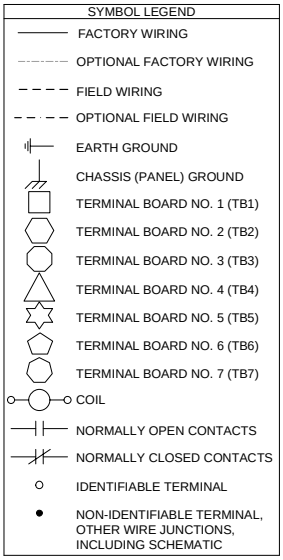
NOTES:
- NUMBER PLACED AFTER DASH FOLLOWING COLOR CODE INDICATES WIRE GAGE. FOR EXAMPLE> BK-12 IS A BLACK, 12 AWG WIRE.
- NO NUMBER AFTER COLOR CODE INDICATES 18 AWG WIRE. FOR EXAMPLE> BK IS A BLACK 18 AWG WIRE.
- WHEN COLOR COMBINATIONS ARE USED, THE COLORS ARE SEPARATED BY A SLASH (/). FOR EXAMPLE: ORANGE/WHITE (O/W). THE PRIMARY COLOR CODE OF THE WIRE IS SHOWN FIRST, TRACER OR STRIPE SHOWN LAST.
- BONDING CONDUCTORS INDICATED AS GREEN MAY ALSO BE GREEN WITH ONE OR MORE YELLOW STRIPES.

FUSE TABLE				
FUSE NO.	CLASS	VOLTS AC	AMPERES	TIME DELAY
F1,F2,F3†	CC	600	+	YES

† F3 IS USED ONLY WHEN OPTIONAL POWER MONITOR IS FURNISHED.

+ 208/230 VOLT UNITS USE 2 AMPERES.
460 VOLT UNITS USE 1 AMPERES.

SYMBOL LEGEND



1. THREE PHASE FIELD POWER SUPPLY PER UNIT RATING PLATE. MINIMUM CIRCUIT AMPACITY AND MAXIMUM SIZE OF TIME-DELAY FUSE OR HACR-TYPE CIRCUIT BREAKER PER UNIT RATING PLATE. PROVIDE DISCONNECTING MEANS AND EQUIPMENT GROUNDING AS REQUIRED.

2. TRANSFORMER MAY HAVE TAPS FOR MULTIPLE SYSTEM POWER SUPPLY VOLTAGES. BEFORE APPLYING POWER TO THE UNIT, ENSURE TRANSFORMER IS WIRED FOR APPROPRIATE SYSTEM POWER SUPPLY. INSULATE SEPARATELY ANY UNUSED LEADS. POLARITY IS NOT INDICATED. TYPICAL TRANSFORMER SHOWN. SEE TRANSFORMER LABEL FOR LEAD COLOR CODING. A PUSH TO RESET FUSEHOLDER-TYPE THERMAL CIRCUIT BREAKER IS MOUNTED ON THE TRANSFORMER. THE CIRCUIT BREAKER IS WIRED IN SERIES WITH ONE SIDE OF THE TRANSFORMER SECONDARY WINDING.

3. SEE FIGURE 1 ON SHEET 3 OF THIS DRAWING FOR BOARD LAYOUT, SENSOR LOCATIONS, TEMPERATURE SETTING NOTE, AND SENSOR RESISTANCE VERSUS TEMPERATURE GRAPH.

4. SEE FIGURE 2 ON SHEET 3 OF THIS DRAWING FOR COMPRESSOR CONTROL MODULE OPERATION.

5. WHEN "FS-L" AND "FS-S" ARE NOT USED, THIS WIRE CONNECTS DIRECTLY TO TERMINAL 5 OF "TB3".

6. WIRED AS SHOWN FOR OPEN LOOP OR HIGH TEMPERATURE CLOSED LOOP APPLICATIONS. FOR LOW TEMPERATURE CLOSED LOOP APPLICATIONS, MOVE THIS WIRE FROM TERMINAL 6 TO TERMINAL 7 ON "TB4".

7. WHEN "LTC" IS NOT USED, THIS WIRE CONNECTS DIRECTLY FROM "HPS1" TO EITHER "HDT1" WHEN USED OR TO HPS TERMINAL OF "CCM1" ("HDT1" NOT USED).

8. WHEN OPTIONAL "LTC" IS NOT USED, THESE TWO WIRES ARE SPLICED TOGETHER.

9. WIRED AS SHOWN FOR OPEN LOOP OR HIGH TEMPERATURE CLOSED LOOP APPLICATIONS. FOR LOW TEMPERATURE CLOSED LOOP APPLICATIONS, MOVE THIS WIRE FROM TERMINAL 8 TO TERMINAL 9 ON "TB5".

10. WHEN "LTC" IS NOT USED, THIS WIRE CONNECTS DIRECTLY FROM "HPS2" TO EITHER "HDT2" WHEN USED OR TO HPS TERMINAL OF "CCM2" ("HDT2" NOT USED).

11. WHEN OPTIONAL "LTC" IS NOT USED, THESE TWO WIRES ARE SPLICED TOGETHER.

12. WHEN "CHR" IS NOT USED, THIS WIRE CONNECTS DIRECTLY TO TERMINAL 1 ON "PM" --OR-- WHEN "PM" IS NOT USED, TO TERMINAL 4 ON "EMR" --OR-- WHEN "EMR" IS NOT USED,TO TERMINAL R ON "TB1".

13. IF POWER MONITOR OUTPUT CONTACTS DO NOT TRANSFER WHEN POWER IS APPLIED TO UNIT (BICOLOR LED GLOWS GREEN UNDER NORMAL CONDITIONS AND RED DURING FAULT CONDITIONS):
1. VERIFY THAT ALL THREE PHASES ARE PRESENT AND ARE OF THE CORRECT VOLTAGE. IF ALL THREE PHASES ARE PRESENT AND ARE OF THE CORRECT VOLTAGE, PHASE ROTATION MAY BE INCORRECT. PERFORM STEP 2.
2. DISCONNECT POWER TO THE WW* UNIT. VERIFY THAT POWER IS IN FACT DISCONNECTED. SWAP ANY TWO OF THE THREE UNIT POWER SUPPLY WIRES. WHEN POWER IS REAPPLIED, OUTPUT CONTACTS SHOULD NOW TRANSFER.

14. TYPICAL FIELD CONTROL WIRING SHOWN. ACTUAL FIELD WIRING MAY DIFFER FROM WIRING SHOWN HERE. USE 18 AWG MINIMUM FOR FIELD 24 VOLT CONTROL WIRING. TYPICAL REMOTE SWITCH SHOWN. REMOTE SWITCH MAY BE SUPPLIED BY OTHERS OR IS AVAILABLE AS AN OPTIONAL ACCESSORY FROM THE FACTORY. MINIMUM PILOT DUTY RATING OF EACH POLE OF REMOTE SWITCH IS 24 VOLT-AMPERES @ 24 VOLTS AC WHEN CONNECTED AS SHOWN.

15. "RVS1" AND "RVS2" ARE USED ONLY WITH WWR MODELS AND ARE ENERGIZED IN COOLING MODE.
"RVS1" AND "RVS2" ARE NOT USED WITH WWC AND WWH MODELS.

16. AQUASTATS "TS-H" AND "TS-C" ARE NOT USED WHEN OPTIONAL FACTORY INSTALLED TEMPERATURE CONTROLLER "TC" IS FURNISHED. TYPICAL AQUASTATS SHOWN. AQUASTATS MAY BE SUPPLIED BY OTHERS OR ARE AVAILABLE AS AN OPTIONAL ACCESSORY FROM THE FACTORY. MINIMUM PILOT DUTY RATING OF EACH POLE OF AQUASTAT IS 24 VOLT-AMPERES @ 24 VOLTS AC WHEN CONNECTED AS SHOWN.

17. THIS WIRE CONNECTS DIRECTLY FROM TERMINAL S1 TO TERMINAL Y1 ON "TB1" WHEN OPTIONAL TEMPERATURE CONTROLLER "TC" IS NOT FURNISHED.

18. THIS WIRE CONNECTS DIRECTLY FROM TERMINAL S2 TO TERMINAL Y2 ON "TB1" WHEN OPTIONAL TEMPERATURE CONTROLLER "TC" IS NOT FURNISHED.

19. WHEN OPTIONAL TEMPERATURE CONTROLLER "TC" IS FURNISHED, INSTALLER MUST PROGRAM CONTROLLER. REFER TO TEMPERATURE CONTROL INSTALLATION INSTRUCTIONS.
WITH REVERSE-CYCLE WWR UNITS, PROGRAM CONTROLLER AS ONE STAGE COOLING AND ONE STAGE HEATING. STAGE 1 IS THE COOLING STAGE AND STAGE 2 IS THE HEATING STAGE.
INSTALL SENSOR ON THE WATER INLET PIPE (LOAD COIL).

20. CONDUCTOR "O" REQUIRED WITH WWR REVERSE CYCLE UNITS.
CONDUCTOR "O" NOT USED WITH WWC COOLING AND WWR HEATING UNITS.

21. "CHR" IS USED ONLY WITH "WWR" UNITS.
"CHR" IS NOT USED WITH "WWC" AND "WWH" UNITS.

22. COMPRESSOR RELAY CONTACTS ARE PROVIDED TO OPERATE AN EXTERNAL PILOT DUTY LOAD (SUCH AS A PUMP RELAY COIL) WITH THE COMPRESSORS.
- AN EXTERNAL LOAD POWERED BY TRANSFORMER "TR1" IN THE WW* UNIT MUST NOT EXCEED 12 VA SEALED (96 VA INRUSH) @ 24 VOLTS AC.
- EXTERNAL LOADS POWERED FROM AN EXTERNAL SOURCE ARE LIMITED TO CLASS 2 CIRCUITS ONLY (30 VOLTS AC MAXIMUM). EXTERNAL LOAD CHARACTERISTICS MUST NOT EXCEED 10 AMPS MAKE, 1 AMP BREAK. **MAINTAIN SEPARATION BETWEEN CLASS 2 CIRCUITS OF DIFFERENT SOURCES.**
- PROVIDE DISCONNECTING MEANS, EQUIPMENT GROUNDING, AND OVERCURRENT PROTECTION AS REQUIRED.

WIRING DIAGRAM # 0962I-2633B, REV. B
WW* 120, 150, 180, 240, 300

Optional Low Temperature Control Board "LTC" – 3 Phase, Unit Sizes 120, 150, 180, 240 and 300

The control board is powered by 24 volts AC, 50/60 hertz which is applied to the 24 VAC terminals. The control will energize the output relays (COM 1 makes connection with NO 1 and COM 2 makes connection with NO 2), only if the temperatures of both Sensor 1 and Sensor 2 are above the selected temperature which is 20°F or 35°F.

Note: *Always disconnect power to WW* unit before moving jumpers.*

While the output relays are energized, the control keeps monitoring Sensor 1 and Sensor 2 to make sure that the temperature of the sensors is always above the selected temperture, the control will de-energize both ouput relays until the temperature of the sensor is 2.5 degrees above the selected temperature. For example, you set the temperature to 20°F. The output relays will de-energize when the sensor temperature drops below 20°F. The control will re-energize the output relays when the sensor temperature rises above 22.5°F. Additionally, the control will monitor each individual sensor to make sure it isn't broken or shorted. If either Sensor 1 or Sensor 2 fails short or open before or during operation, the control will de-energize both output relays until the sensor is repaired or replaced.

Table 8: LTC board sensor locations

Model	Sensor 1	Sensor 2
WCA	Liquid Out - Load Coil 1	Liquid Out - Source Coil 1
WHA	Liquid Out - Load Coil 1	Liquid Out - Source Coil 1
WRA	Liquid Out - Load Coil 1	Liquid Out - Source Coil 1

Figure 7: "LTC" board jumper settings

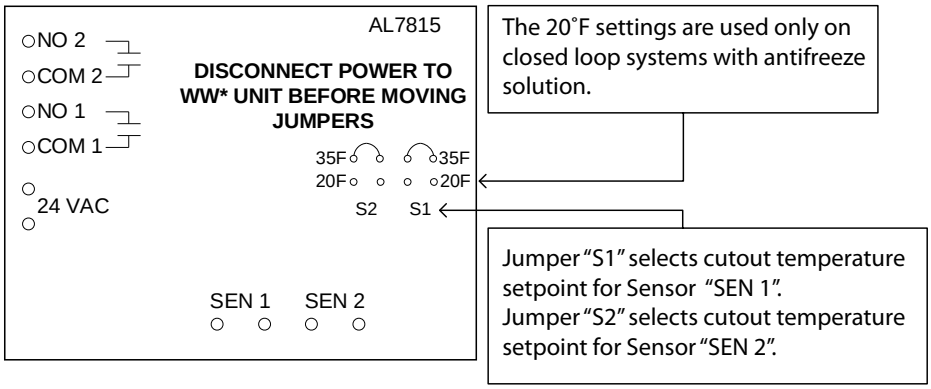
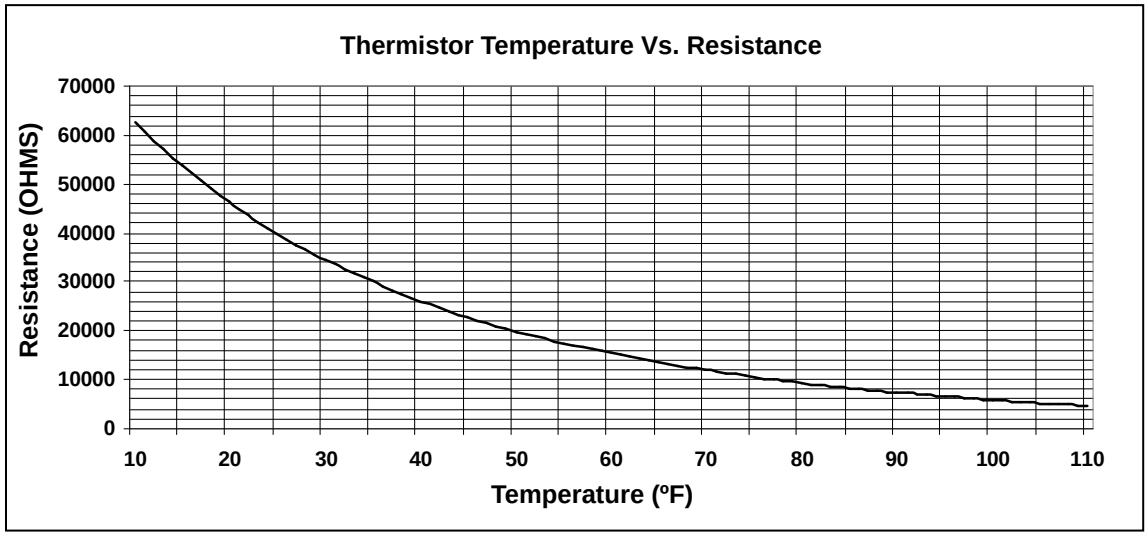


Figure 8: Thermistor temperature vs. resistance graph



Compressor Control Module Functional Operation – 208-230/60/3, Unit Sizes 120, 150, 180, 240 and 300

Power:

For proper operation there must always be 18 to 30 volts AC present at the R and C terminals.

Time Delays:

1. **Anti-short cycle:** provides the compressor with short cycle protection for a selectable time of 10 seconds (for servicing only) or 5 minutes (normal operationalsetting). This feature is enabled upon power loss to the circuit board, loss of the Y signal, or the opening of a switch connected to the HPS or LPS terminals. If the selecto shunt is not in place, the circuit will default to a 5 minute anti short-cycle delay.
2. **Delay on make:** Delays the turning on of the compressor contactor for a selectable time of 3 or 6 seconds every time the Y signal coalls. If the selector shunit is not in place, the circuit will default to a 6 second delay on make.
3. **Low Pressure Bypass:** Allows time for the low side pressure to build up enough pressure at start up for the 60 psig low pressure switch to close. The circuit will offer a selectable timing range of 90, 120, 180, or 300 seconds. This time delay will start upon a Y call from the thermostat. Should the 60 psig low pressure switch still be open after the selected delay expires, the compressor will de-energize and the alarm will energize. This will be defined as an LPS fault, (factory set for 90 seconds). If necessary to increase the delay, select the smallest amount of bypass time delay that allows the compressor to start and operate.

Note: *The 60 psig low pressure switch is jumpered out in low temperature closed loop system applications using antifreeze solution.*
Also note tht the 35 psig low pressure switch is connected in series with the high pressure switch to the HPS terminals and is never bypassed.

Operation Of The HPS Terminals

Switches connected to the HPS terminals are connected in series with the Y signal through the circuit board. These switches are also connected in series witht the T1 output in order to provide an immediate response if a switch were to open. If a switch conncecte to the HPS terminal should open, the status LED will blink once.

Operation Of The LPS Terminals

The 60 psig low pressure switch (brown leads) is connected to the LPS terminals in series with the Y signal through the circuit board. The 60 psig low pressure switch is connected in series with the Y signal to the processor only. This will allow the control to monitor the low pressure switch status and initiate the bypass delay. If the 60 psig low pressure switch should open, the status LED will blink twice.

Normal Cycle

A normal cycle will begin with 24 VAC applied to the R and C terminals on the circuit board. Once the control is powered up, the processor will read the Y signal to determine if it is calling. If it is calling and the switches connected to the HPS terminals are closed, the delay on make and low pressure bypass timers will initiate.

If a switch connected to the HPS terminals is open, the control will enter the lockout mode. After the delay on make time expires, the compressor contactor will energize. It will remain energized as the low pressure bypass timer counts down.

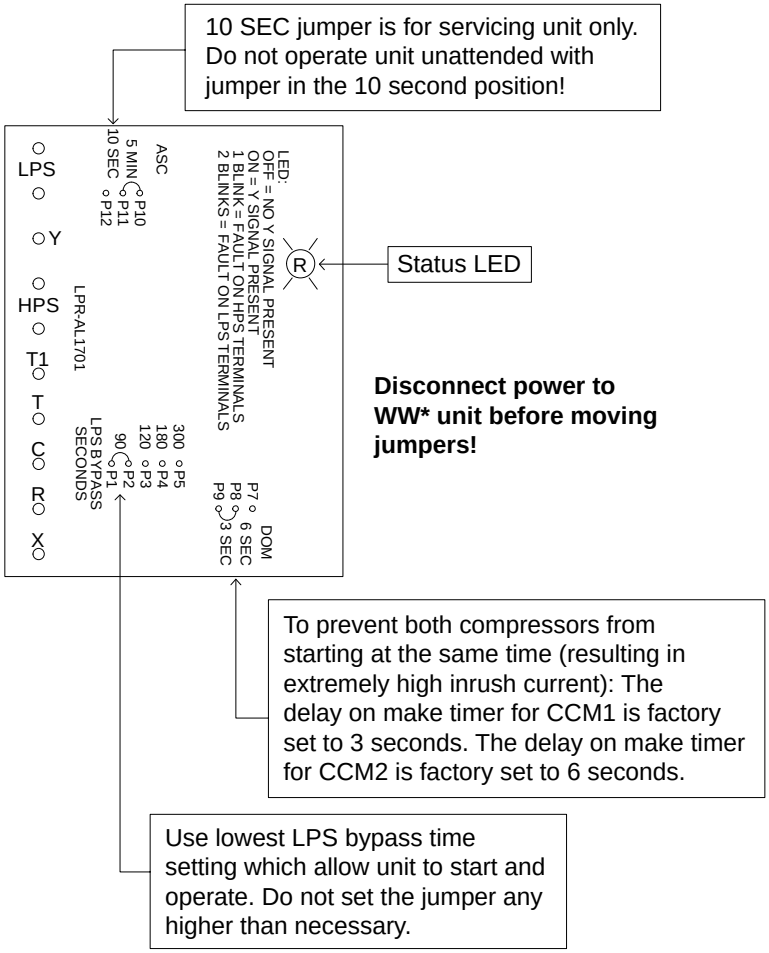
If the 60 psig low pressure switch is closed after the timer expires, the compressor will remain energized. If it is still open, the control will enter the lockout mode.

If power is lost, or the Y signal is removed, or an HPS or LPS terminal switch fault is detected while the compressor contactor is energized, the unit will initiate the anti short-cycle delay.

Alarm/Lockout

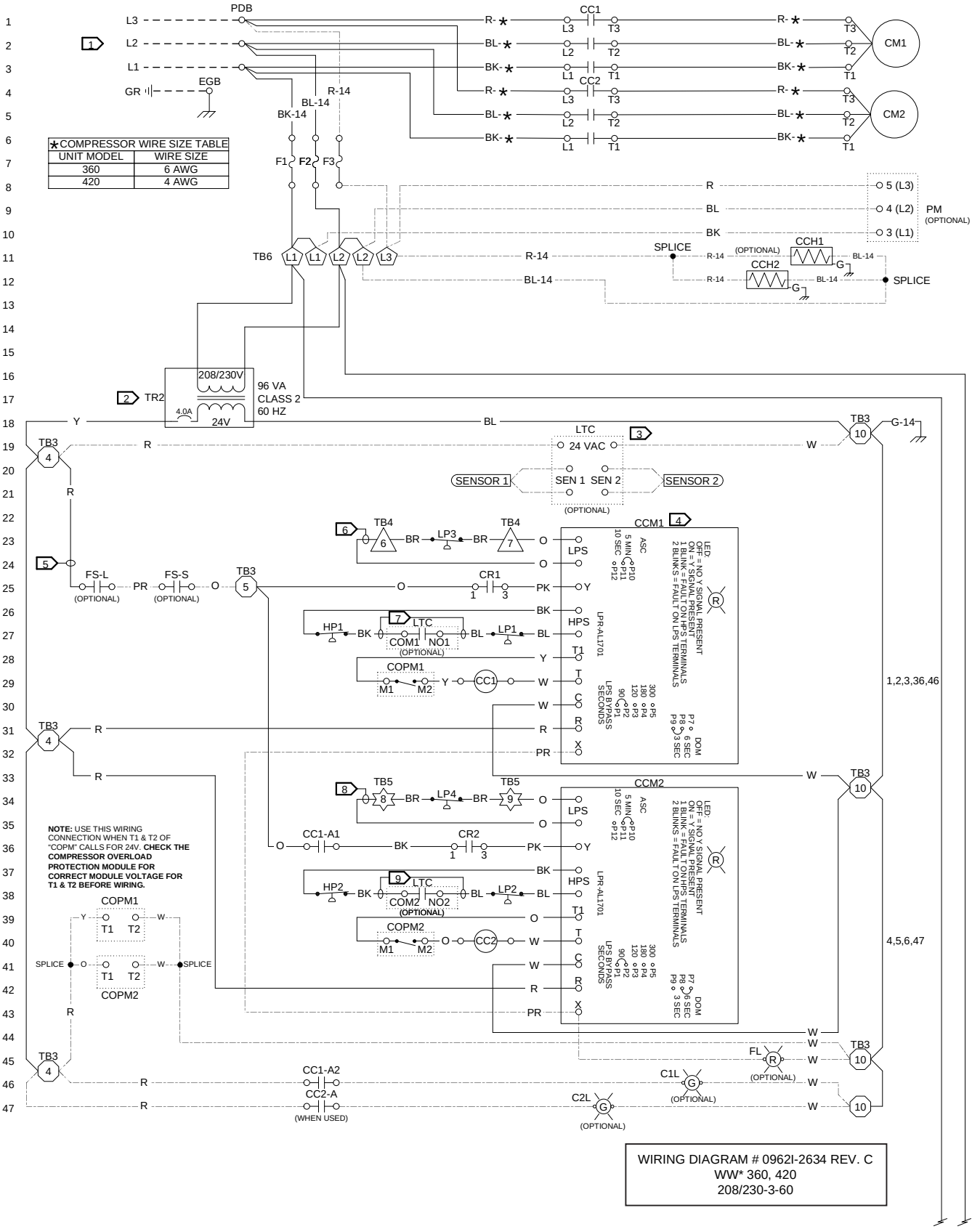
The alarm terminal will output the R signal and will only be energized as a result of an HPS or LPS fault. An HPS fault is defined as the opening of a switch connected to the HPS terminals for any amount of time. An LPS fault is defined as the 60 psig low pressure switch open after the bypass time. If any of these conditions are true, the unit will de-energize the compressor and energize the alarm. This will be defined as a lockout condition. To reset a lockout condition, the pressure fault must be corrected and the Y signal from the thermostat must be cycled.

Figure 9: Compressor control module functional operation



208/230-60-3, Unit Sizes 360, 420

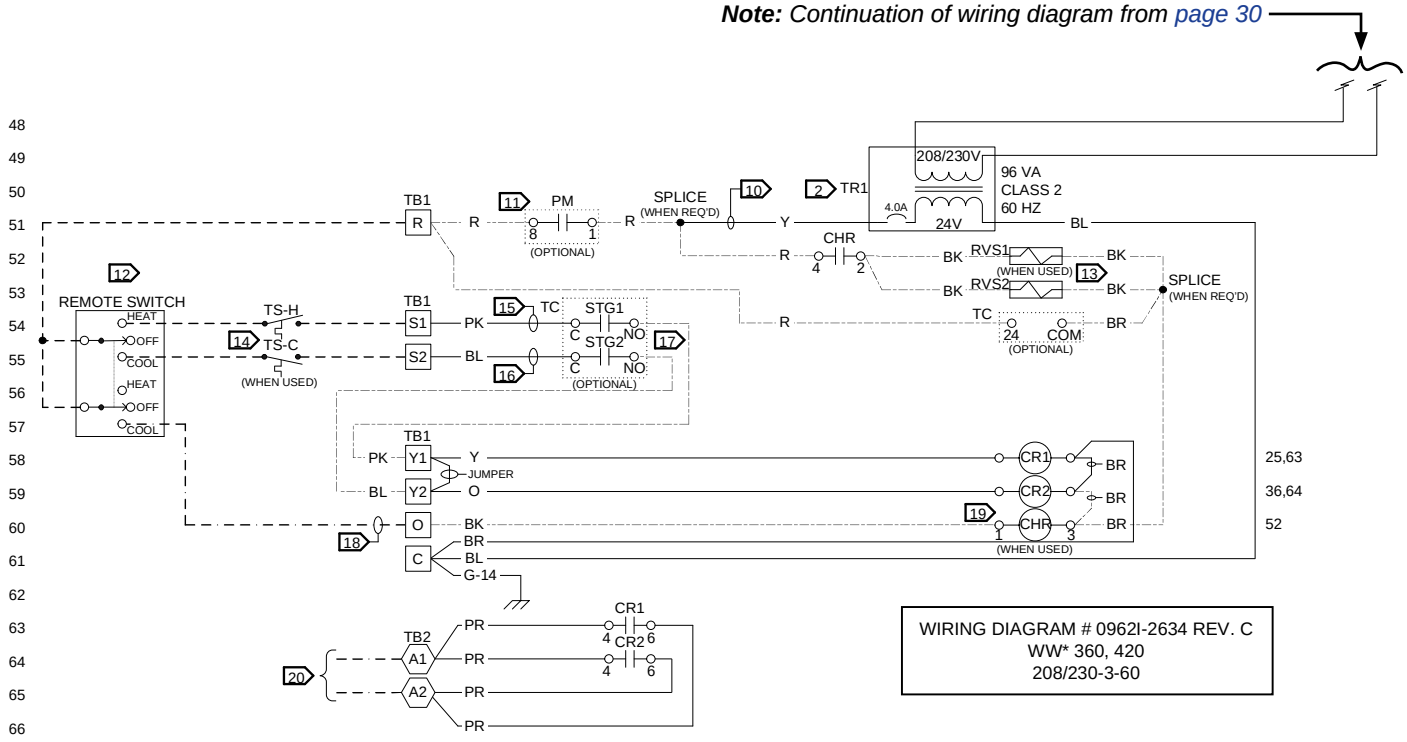
Note: *See wiring diagram legend on page 32.*



Note: *See continuation of wiring diagram on page 31*

(Continued) 208/230-60-3, Unit Sizes 360, 420

Note: *Continuation of wiring diagram from page 30*



Note: *See wiring diagram legend on page 32.*

Legend

208/230-60-3, Unit Sizes 360, 420

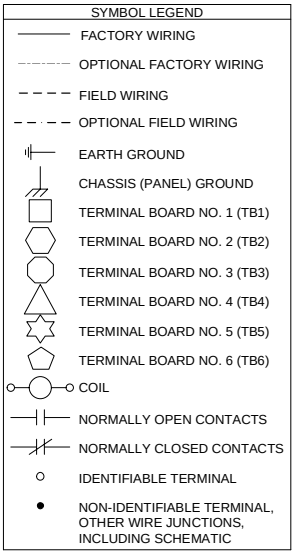
LEGEND		
FUNCTIONAL DESIGNATION	LINE NUMBER	DESCRIPTION
C1L	46	OPTIONAL INDICATOR LIGHT - COMPRESSOR 1 ON
C2L	47	OPTIONAL INDICATOR LIGHT - COMPRESSOR 2 ON
CC1	29	COMPRESSOR NO. 1 CONTACTOR
CC1-A1	#	"CC1" AUXILIARY CONTACT NO. 1
CC1-A2	#	"CC1" AUXILIARY CONTACT NO. 2 (WHEN USED)
CC2	40	COMPRESSOR NO. 2 CONTACTOR
CC2-A	#	"CC" AUXILIARY CONTACT (WHEN USED)
CCH1,CCH2	11,12	CRANKCASE HEATER NO. 1 & NO. 2
CCM1	22	COMPRESSOR CONTROL MODULE NO. 1
CCM2	33	COMPRESSOR CONTROL MODULE NO. 2
CHR	60	CHANGEOVER RELAY (WHEN USED)
CM1	2	COMPRESSOR NO. 1
CM2	5	COMPRESSOR NO. 2
COPM1	12,29	COMPRESSOR NO. 1 OVERLOAD PROTECTION MODULE
COPM2	14,40	COMPRESSOR NO. 2 OVERLOAD PROTECTION MODULE
CR1	58	COMPRESSOR NO. 1 PILOT RELAY
CR2	59	COMPRESSOR NO. 2 PILOT RELAY
EGB	4	EQUIPMENT GROUNDING BAR
F1,F2,F3	7	FUSING - SEE FUSE TABLE
FL	45	OPTIONAL INDICATOR LIGHT - FAULT
FS-L	25	OPTIONAL FLOW PROVING SWITCH – LOAD COIL
FS-S	25	OPTIONAL FLOW PROVING SWITCH – SOURCE COIL
HP1	27	HIGH DISCHARGE PRESSURE CUTOUT SWITCH NO. 1
HP2	38	HIGH DISCHARGE PRESSURE CUTOUT SWITCH NO. 2
LP1	27	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 1 (CKT 1)
LP2	38	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 2 (CKT 2)
LP3	23	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 3 (CKT 1)
LP4	34	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 4 (CKT 2)
LTC	19,27,38	LOW FLUID TEMPERATURE CUTOUT MODULE
PDB	1,2,3	POWER DISTRIBUTION BLOCK
PM	9,51	OPTIONAL POWER MONITOR
RVS1	52	REVERSING VALVE SOLENOID CKT 1 (WHEN USED)
RVS2	53	REVERSING VALVE SOLENOID CKT 2 (WHEN USED)
TB1	+	TERMINAL BOARD NO. 1
TB2	64,65	TERMINAL BOARD NO. 2
TB3	+	TERMINAL BOARD NO. 3
TB4	23	TERMINAL BOARD NO. 4
TB5	34	TERMINAL BOARD NO. 5
TB6	11	TERMINAL BOARD NO. 6
TR1	50	CONTROL TRANSFORMER NO. 1
TR2	17	CONTROL TRANSFORMER NO. 2
TC	54	TEMPERATURE CONTROLLER (OPTIONAL)
TS-C	55	AQUASTAT – COOLING (WHEN USED)
TS-H	54	AQUASTAT – HEATING (WHEN USED)

SEE LINE NUMBER TO THE RIGHT OF CONTACTOR COIL ON WIRING DIAGRAM.
\+ MULTIPLE LINE NUMBERS.

WIRE COLOR LEGEND	
BK: BLACK	PK: PINK
BL: BLUE	PR (V): PURPLE (VIOLET)
BR: BROWN	R: RED
G: GREEN	W: WHITE
GY: GRAY	Y: YELLOW
O: ORANGE	

NOTES:
- ❖ NUMBER PLACED AFTER DASH FOLLOWING COLOR CODE INDICATES WIRE GAGE. FOR EXAMPLE> BK-12 IS A BLACK, 12 AWG WIRE.
- ❖ NO NUMBER AFTER COLOR CODE INDICATES 18 AWG WIRE. FOR EXAMPLE> BK IS A BLACK 18 AWG WIRE.
- ❖ BONDING CONDUCTORS INDICATED AS GREEN MAY ALSO BE GREEN WITH ONE OR MORE YELLOW STRIPES.
- ❖ ASTERISK AFTER DASH FOLLOWING COLOR CODE INDICATES REFERRAL TO COMPRESSOR WIRE SIZE TABLE.

SYMBOL LEGEND



FUSE TABLE				
FUSE NO.	CLASS	VOLTS AC	AMPERES	TIME DELAY
F1,F2,F3†	CC	600	3	YES

† F3 IS USED ONLY WHEN OPTIONAL POWER MONITOR IS FURNISHED.

1. THREE PHASE FIELD POWER SUPPLY PER UNIT RATING PLATE. MINIMUM CIRCUIT AMPACITY AND MAXIMUM SIZE OF TIME-DELAY FUSE OR HACR-TYPE CIRCUIT BREAKER PER UNIT RATING PLATE. PROVIDE DISCONNECTING MEANS AND EQUIPMENT GROUNDING AS REQUIRED.
2. TRANSFORMER MAY HAVE TAPS FOR 120V, 208V, 240V, OR 480V SYSTEM POWER SUPPLY. BEFORE APPLYING POWER TO THE UNIT, ENSURE TRANSFORMER IS WIRED FOR APPROPRIATE SYSTEM POWER SUPPLY. INSULATE SEPARATELY ANY UNUSED LEADS. POLARITY IS NOT INDICATED. TYPICAL TRANSFORMER SHOWN. SEE TRANSFORMER LABEL FOR LEAD COLOR CODING. A 4.0 AMP POTTER & BRUMFIELD PUSH TO RESET FUSEHOLDER-TYPE THERMAL CIRCUIT BREAKER, P&B PART NO. W28XQ1A-4, IS MOUNTED ON THE TRANSFORMER. THE W28-X IS WIRED IN SERIES WITH ONE SIDE OF THE TRANSFORMER SECONDARY WINDING.
3. SEE FIGURE 1 ON SHEET 3 OF THIS DRAWING FOR BOARD LAYOUT FOR SENSOR LOCATIONS, TEMPERATURE SETTING NOTE, AND SENSOR RESISTANCE VERSUS TEMPERATURE GRAPH.
4. SEE FIGURE 2 ON SHEET 3 OF THIS DRAWING FOR COMPRESSOR CONTROL MODULE OPERATION.
5. WHEN "FS-L" AND "FS-S" ARE NOT USED, THIS WIRE CONNECTS DIRECTLY TO TERMINAL 6 OF "TB3".
6. WIRED AS SHOWN FOR OPEN LOOP OR HIGH TEMPERATURE CLOSED LOOP APPLICATIONS. FOR LOW TEMPERATURE CLOSED LOOP APPLICATIONS, MOVE THIS WIRE FROM TERMINAL 6 TO TERMINAL 7 ON "TB4".
7. WHEN OPTIONAL "LTC" IS NOT USED, THESE TWO WIRES ARE SPLICED TOGETHER.
8. WIRED AS SHOWN FOR OPEN LOOP OR HIGH TEMPERATURE CLOSED LOOP APPLICATIONS. FOR LOW TEMPERATURE CLOSED LOOP APPLICATIONS, MOVE THIS WIRE FROM TERMINAL 8 TO TERMINAL 9 ON "TB5".
9. WHEN OPTIONAL "LTC" IS NOT USED, THESE TWO WIRES ARE SPLICED TOGETHER.
10. WHEN "CHR" IS NOT USED, THIS WIRE CONNECTS DIRECTLY TO EITHER TERMINAL 1 ON "PM" --OR-- WHEN "PM" IS NOT USED, TO TERMINAL R ON "TB1".
11. IF POWER MONITOR OUTPUT CONTACTS DO NOT TRANSFER WHEN POWER IS APPLIED TO UNIT (BICOLOR LED GLOWS GREEN UNDER NORMAL CONDITIONS AND RED DURING FAULT CONDITIONS):
    1. VERIFY THAT ALL THREE PHASES ARE PRESENT AND ARE OF THE CORRECT VOLTAGE. IF ALL THREE PHASES ARE PRESENT AND ARE OF THE CORRECT VOLTAGE, PHASE ROTATION MAY BE INCORRECT. PERFORM STEP 2.
    2. DISCONNECT POWER TO THE WW* UNIT. VERIFY THAT POWER IS IN FACT DISCONNECTED. SWAP ANY TWO OF THE THREE UNIT POWER SUPPLY WIRES. WHEN POWER IS REAPPLIED, OUTPUT CONTACTS SHOULD NOW TRANSFER.
12. TYPICAL FIELD CONTROL WIRING SHOWN. ACTUAL FIELD WIRING MAY DIFFER FROM WIRING SHOWN HERE. USE 18 AWG MINIMUM FOR FIELD 24 VOLT CONTROL WIRING. TYPICAL REMOTE SWITCH SHOWN. REMOTE SWITCH MAY BE SUPPLIED BY OTHERS OR IS AVAILABLE AS AN OPTIONAL ACCESSORY FROM THE FACTORY. MINIMUM PILOT DUTY RATING OF EACH POLE OF REMOTE SWITCH IS 24 VOLT-AMPERES @ 24 VOLTS AC WHEN CONNECTED AS SHOWN.
13. "RVS1" AND "RVS2" ARE USED ONLY WITH WWR MODELS AND ARE ENERGIZED IN COOLING MODE.
    "RVS1" AND "RVS2" ARE NOT USED WITH WWC AND WWH MODELS.
14. AQUASTATS "TS-H" AND "TS-C" ARE NOT USED WHEN OPTIONAL FACTORY INSTALLED TEMPERATURE CONTROLLER "TC" IS FURNISHED. TYPICAL AQUASTATS SHOWN. AQUASTATS MAY BE SUPPLIED BY OTHERS OR ARE AVAILABLE AS AN OPTIONAL ACCESSORY FROM THE FACTORY. MINIMUM PILOT DUTY RATING OF EACH POLE OF AQUASTAT IS 24 VOLT-AMPERES @ 24 VOLTS AC WHEN CONNECTED AS SHOWN.
15. THIS WIRE CONNECTS DIRECTLY FROM TERMINAL S1 TO TERMINAL Y1 ON "TB1" WHEN OPTIONAL TEMPERATURE CONTROLLER "TC" IS NOT FURNISHED.
16. THIS WIRE CONNECTS DIRECTLY FROM TERMINAL S2 TO TERMINAL Y2 ON "TB1" WHEN OPTIONAL TEMPERATURE CONTROLLER "TC" IS NOT FURNISHED.
17. WHEN OPTIONAL TEMPERATURE CONTROLLER "TC" IS FURNISHED, INSTALLER MUST PROGRAM CONTROLLER. REFER TO TEMPERATURE CONTROL INSTALLATION INSTRUCTIONS.
    WITH REVERSE-CYCLE WWR UNITS, PROGRAM CONTROLLER AS ONE STAGE COOLING AND ONE STAGE HEATING. STAGE 1 IS THE COOLING STAGE AND STAGE 2 IS THE HEATING STAGE.
    INSTALL SENSOR @ WATER INLET PIPE (LOAD COIL).
18. CONDUCTOR "O" REQUIRED WITH WWR REVERSE CYCLE UNITS.
    CONDUCTOR "O" NOT USED WITH WWC COOLING AND WWR HEATING UNITS.
19. "CHR" IS USED ONLY WITH "WWR" UNITS.
    "CHR" IS NOT USED WITH "WWC" AND "WWH" UNITS.
20. COMPRESSOR RELAY CONTACTS ARE PROVIDED TO OPERATE AN EXTERNAL PILOT DUTY LOAD (SUCH AS A PUMP RELAY COIL) WITH THE COMPRESSORS.
    - ❖ AN EXTERNAL LOAD POWERED BY TRANSFORMER "TR1" IN THE WW* UNIT MUST NOT EXCEED 12 VA SEALED (96 VA INRUSH) @ 24 VOLTS AC.
    - ❖ EXTERNAL LOADS POWERED FROM AN EXTERNAL SOURCE ARE LIMITED TO CLASS 2 CIRCUITS ONLY (30 VOLTS AC MAXIMUM). EXTERNAL LOAD CHARACTERISTICS MUST NOT EXCEED 10 AMPS MAKE, 1 AMP BREAK. **MAINTAIN SEPARATION BETWEEN CLASS 2 CIRCUITS OF DIFFERENT SOURCES.**
    - ❖ PROVIDE DISCONNECTING MEANS, EQUIPMENT GROUNDING, AND OVERCURRENT PROTECTION AS REQUIRED.

WIRING DIAGRAM # 0962I-2634 REV. C
WW* 360, 420
208/230-3-60

Optional Low Temperature Control Board "LTC" – 208/230-60-3, Unit Sizes 360, 420

The control board is powered by 24 volts AC, 50/60 hertz which is applied to the 24 VAC terminals. The control will energize the output relays (COM 1 makes connection with NO 1 and COM 2 makes connection with NO 2), only if the temperatures of both Sensor 1 and Sensor 2 are above the selected temperature which is 20°F or 35°F.

Note: *Always disconnect power to WW* unit before moving jumpers.*

While the output relays are energized, the control keeps monitoring Sensor 1 and Sensor 2 to make sure that the temperature of the sensors is always above the selected temperture, the control will de-energize both ouput relays until the temperature of the sensor is 2.5 degrees above the selected temperature. For example, you set the temperature to 20°F. The output relays will de-energize when the sensor temperature drops below 20°F. The control will re-energize the output relays when the sensor temperature rises above 22.5°F. Additionally, the control will monitor each individual sensor to make sure it isn't broken or shorted. If either Sensor 1 or Sensor 2 fails short or open before or during operation, the control will de-energize both output relays until the sensor is repaired or replaced.

Table 9: LTC board sensor locations

Model	Sensor 1	Sensor 2
WCA	Liquid Out - Load Coil 1	Liquid Out - Source Coil 1
WHA	Liquid Out - Load Coil 1	Liquid Out - Source Coil 1
WRA	Liquid Out - Load Coil 1	Liquid Out - Source Coil 1

Figure 10: "LTC" board jumper settings

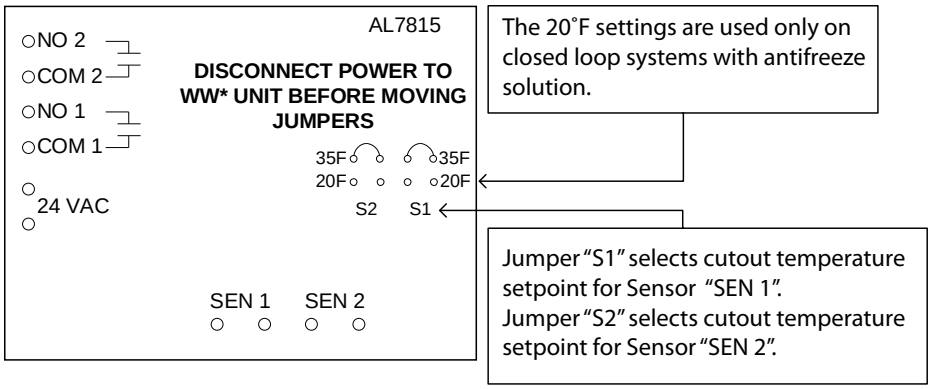
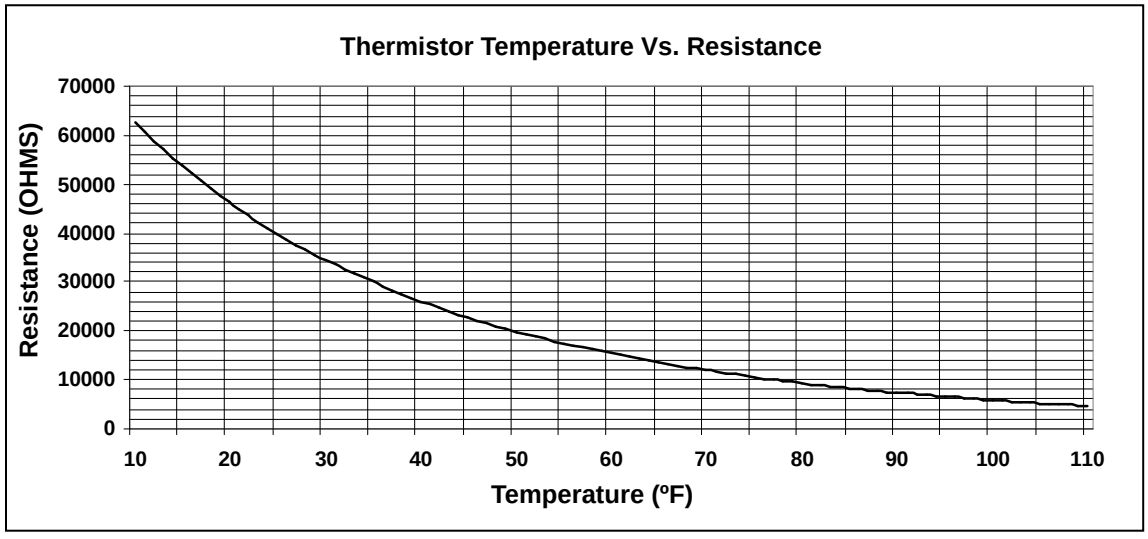


Figure 11: Thermistor temperature vs. resistance graph



Compressor Control Module Functional Operation – 208/230-60-3, Unit Sizes 360, 420

Power:

For proper operation there must always be 18 to 30 volts AC present at the R and C terminals.

Time Delays:

1. **Anti-short cycle:** provides the compressor with short cycle protection for a selectable time of 10 seconds (for servicing only) or 5 minutes (normal operationalsetting). This feature is enabled upon power loss to the circuit board, loss of the Y signal, or the opening of a switch connected to the HPS or LPS terminals. If the selecto shunt is not in place, the circuit will default to a 5 minute anti short-cycle delay.
2. **Delay on make:** Delays the turning on of the compressor contactor for a selectable time of 3 or 6 seconds every time the Y signal coalls. If the selector shunit is not in place, the circuit will default to a 6 second delay on make.
3. **Low Pressure Bypass:** Allows time for the low side pressure to build up enough pressure at start up for the 60 psig low pressure switch to close. The circuit will offer a selectable timing range of 90, 120, 180, or 300 seconds. This time delay will start upon a Y call from the thermostat. Should the 60 psig low pressure switch still be open after the selected delay expires, the compressor will de-energize and the alarm will energize. This will be defined as an LPS fault, (factory set for 90 seconds). If necessary to increase the delay, select the smallest amount of bypass time delay that allows the compressor to start and operate.

Note: *The 60 psig low pressure switch is jumpered out in low temperature closed loop system applications using antifreeze solution.*
Also note tht the 35 psig low pressure switch is connected in series with the high pressure switch to the HPS terminals and is never bypassed.

Operation Of The HPS Terminals

Switches connected to the HPS terminals are connected in series with the Y signal through the circuit board. These switches are also connected in series witht the T1 output in order to provide an immediate response if a switch were to open. If a switch conncecte to the HPS terminal should open, the status LED will blink once.

Operation Of The LPS Terminals

The 60 psig low pressure switch (brown leads) is connected to the LPS terminals in series with the Y signal through the circuit board. The 60 psig low pressure switch is connected in series with the Y signal to the processor only. This will allow the control to monitor the low pressure switch status and initiate the bypass delay. If the 60 psig low pressure switch should open, the status LED will blink twice.

Normal Cycle

A normal cycle will begin with 24 VAC applied to the R and C terminals on the circuit board. Once the control is powered up, the processor will read the Y signal to determine if it is calling. If it is calling and the switches connected to the HPS terminals are closed, the delay on make and low pressure bypass timers will initiate.

If a switch connected to the HPS terminals is open, the control will enter the lockout mode. After the delay on make time expires, the compressor contactor will energize. It will remain energized as the low pressure bypass timer counts down.

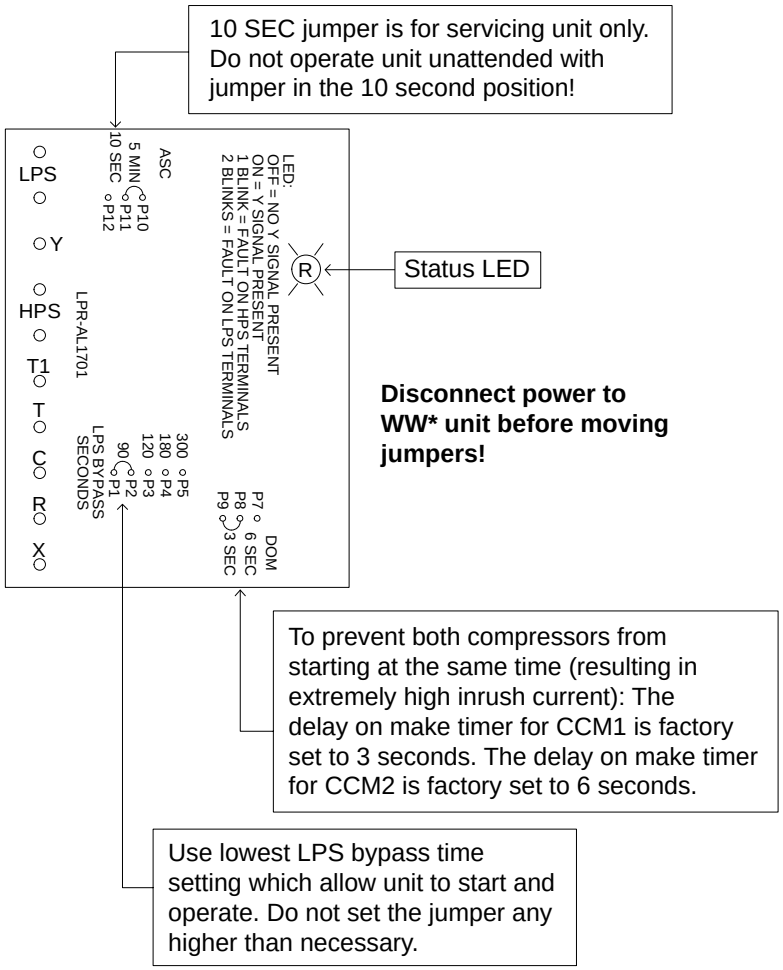
If the 60 psig low pressure switch is closed after the timer expires, the compressor will remain energized. If it is still open, the control will enter the lockout mode.

If power is lost, or the Y signal is removed, or an HPS or LPS terminal switch fault is detected while the compressor contactor is energized, the unit will initiate the anti short-cycle delay.

Alarm/Lockout

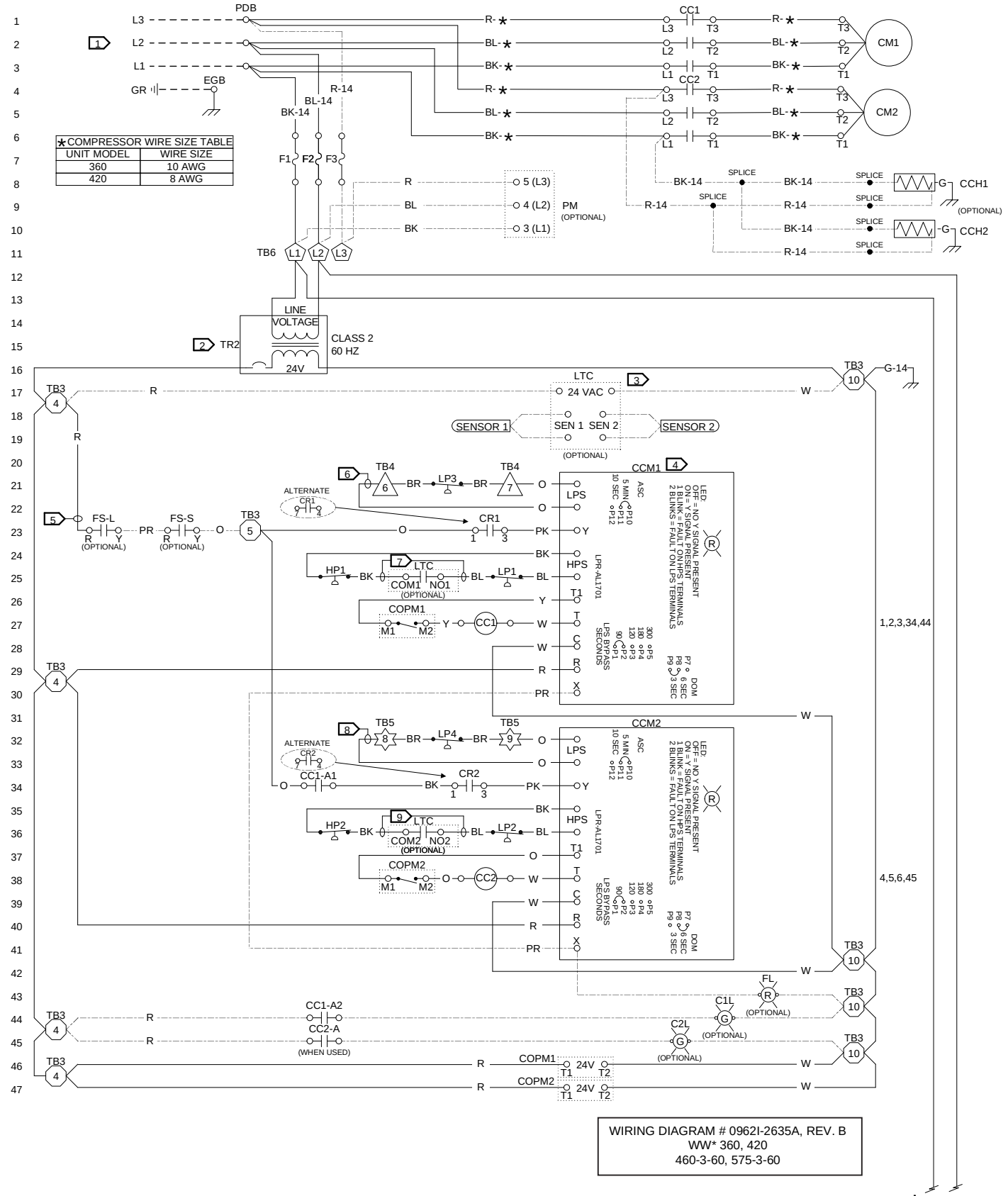
The alarm terminal will output the R signal and will only be energized as a result of an HPS or LPS fault. An HPS fault is defined as the opening of a switch connected to the HPS terminals for any amount of time. An LPS fault is defined as the 60 psig low pressure switch open after the bypass time. If any of these conditions are true, the unit will de-energize the compressor and energize the alarm. This will be defined as a lockout condition. To reset a lockout condition, the pressure fault must be corrected and the Y signal from the thermostat must be cycled.

Figure 12: Compressor control module functional operation



460-60-3, 575-60-3, Unit Sizes 360, 420

Note: *See wiring diagram legend on "Legend" on page 38.*

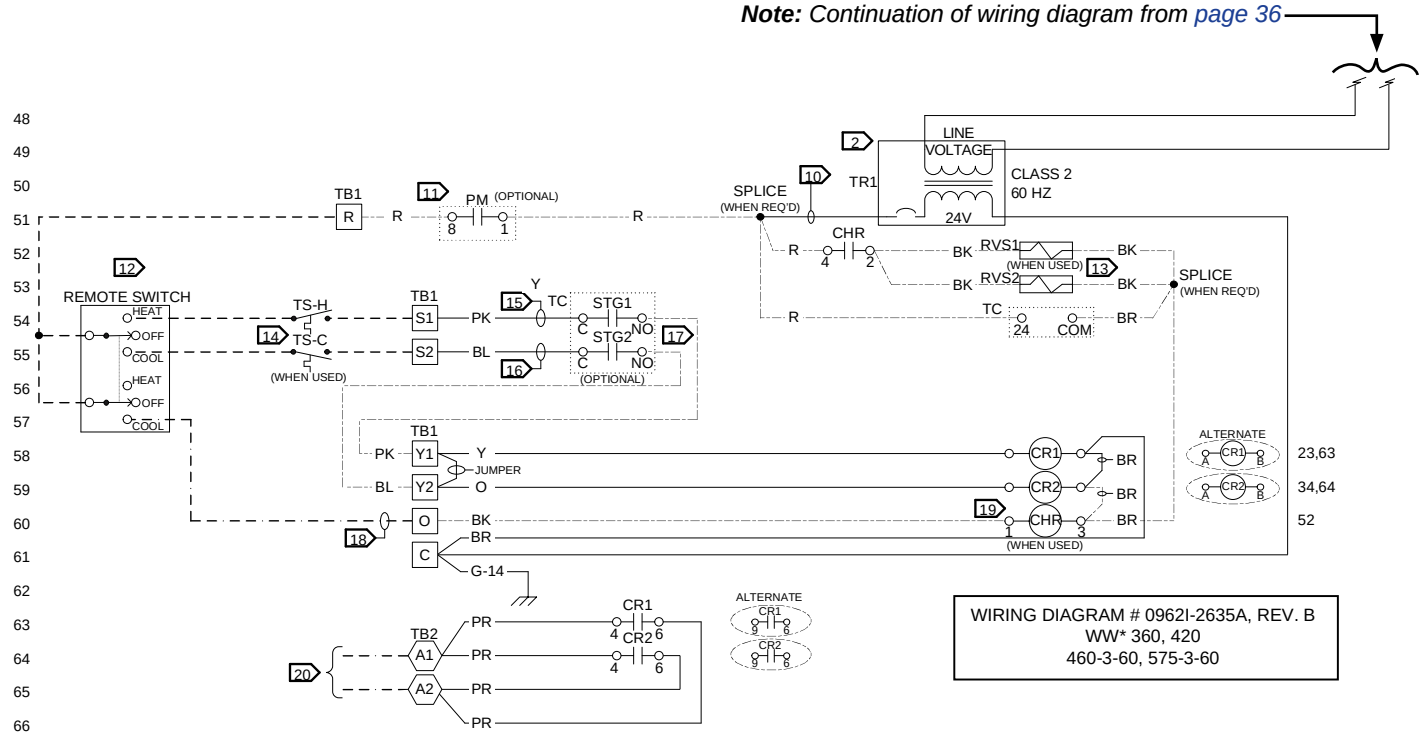


★COMPRESSOR WIRE SIZE TABLE	
UNIT MODEL	WIRE SIZE
360	10 AWG
420	8 AWG

Note: *See continuation of wiring diagram on page 37*

(Continued) 460-60-3, 575-60-3, Unit Sizes 360, 420

Note: *Continuation of wiring diagram from page 36*



WIRING DIAGRAM # 0962I-2635A, REV. B
WW* 360, 420
460-3-60, 575-3-60

Legend

460-60-3, 575-60-3, Unit Sizes 360, 420

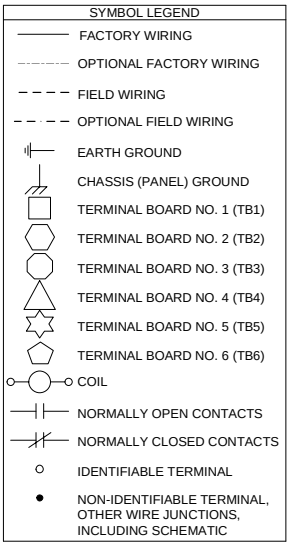
LEGEND		
FUNCTIONAL DESIGNATION	LINE NUMBER	DESCRIPTION
C1L	44	OPTIONAL INDICATOR LIGHT - COMPRESSOR 1 ON
C2L	45	OPTIONAL INDICATOR LIGHT - COMPRESSOR 2 ON
CC1	27	COMPRESSOR NO. 1 CONTACTOR
CC1-A1	#	"CC1" AUXILIARY CONTACT NO. 1
CC1-A2	#	"CC1" AUXILIARY CONTACT NO. 2 (WHEN USED)
CC2	38	COMPRESSOR NO. 2 CONTACTOR
CC2-A	#	"CC" AUXILIARY CONTACT (WHEN USED)
CCM1	21	COMPRESSOR CONTROL MODULE NO. 1
CCM2	32	COMPRESSOR CONTROL MODULE NO. 2
CHR	60	CHANGEOVER RELAY (WHEN USED)
CCH1, CCH2	8,10	CRANKCASE HEATER # 1 , # 2
CM1	2	COMPRESSOR NO. 1
CM2	5	COMPRESSOR NO. 2
COPM1	27,46	COMPRESSOR NO. 1 OVERLOAD PROTECTION MODULE
COPM2	38,47	COMPRESSOR NO. 2 OVERLOAD PROTECTION MODULE
CR1	58	COMPRESSOR NO. 1 PILOT RELAY
CR2	59	COMPRESSOR NO. 2 PILOT RELAY
EGB	4	EQUIPMENT GROUNDING BAR
F1,F2,F3	7	FUSING - SEE FUSE TABLE
FL	43	OPTIONAL INDICATOR LIGHT - FAULT
FS-L	23	OPTIONAL FLOW PROVING SWITCH – LOAD COIL
FS-S	23	OPTIONAL FLOW PROVING SWITCH – SOURCE COIL
HP1	25	HIGH DISCHARGE PRESSURE CUTOUT SWITCH NO. 1
HP2	36	HIGH DISCHARGE PRESSURE CUTOUT SWITCH NO. 2
LP1	25	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 1 (CKT 1)
LP2	36	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 2 (CKT 2)
LP3	21	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 3 (CKT 1)
LP4	32	LOW SUCTION PRESSURE CUTOUT SWITCH NO. 4 (CKT 2)
LTC	17,25,36	LOW FLUID TEMPERATURE CUTOUT MODULE
PDB	1,2,3	POWER DISTRIBUTION BLOCK
PM	9,51	OPTIONAL POWER MONITOR
RVS1	52	REVERSING VALVE SOLENOID CKT 1 (WHEN USED)
RVS2	53	REVERSING VALVE SOLENOID CKT 2 (WHEN USED)
TB1	+	TERMINAL BOARD NO. 1
TB2	64,65	TERMINAL BOARD NO. 2
TB3	+	TERMINAL BOARD NO. 3
TB4	21	TERMINAL BOARD NO. 4
TB5	32	TERMINAL BOARD NO. 5
TB6	11	TERMINAL BOARD NO. 6
TR1	50	CONTROL TRANSFORMER NO. 1
TR2	15	CONTROL TRANSFORMER NO. 2
TC	54,54	TEMPERATURE CONTROLLER (OPTIONAL)
TS-C	55	AQUASTAT – COOLING (WHEN USED)
TS-H	54	AQUASTAT – HEATING (WHEN USED)

SEE LINE NUMBER TO THE RIGHT OF CONTACTOR COIL ON WIRING DIAGRAM.
+ MULTIPLE LINE NUMBERS.

WIRE COLOR LEGEND			
BK:	BLACK	PK:	PINK
BL:	BLUE	PR:	PURPLE
BR:	BROWN	R:	RED
G:	GREEN	W:	WHITE
O:	ORANGE	Y:	YELLOW

NOTES:
- ❖ NUMBER PLACED AFTER DASH FOLLOWING COLOR CODE INDICATES WIRE GAGE. FOR EXAMPLE> BK-12 IS A BLACK, 12 AWG WIRE.
- ❖ NO NUMBER AFTER COLOR CODE INDICATES 18 AWG WIRE. FOR EXAMPLE> BK IS A BLACK 18 AWG WIRE.
- ❖ ASTERISK AFTER DASH FOLLOWING COLOR CODE INDICATES REFERRAL TO COMPRESSOR WIRE SIZE TABLE.

SYMBOL LEGEND



FUSE TABLE				
FUSE NO.	CLASS	VOLTS AC	AMPERES	TIME DELAY
F1,F2,F3†	CC	600	+	YES

† F3 IS USED ONLY WHEN OPTIONAL POWER MONITOR IS FURNISHED.
+ 208/230 VOLT UNITS USE 2 AMPERES.
460 VOLT UNITS USE 1 AMPERES.

1. THREE PHASE FIELD POWER SUPPLY PER UNIT RATING PLATE. MINIMUM CIRCUIT AMPACITY AND MAXIMUM SIZE OF TIME-DELAY FUSE OR HACR-TYPE CIRCUIT BREAKER PER UNIT RATING PLATE. PROVIDE DISCONNECTING MEANS AND EQUIPMENT GROUNDING AS REQUIRED.

2. TRANSFORMER MAY HAVE TAPS FOR MULTIPLE SYSTEM POWER SUPPLY VOLTAGES. BEFORE APPLYING POWER TO THE UNIT, ENSURE TRANSFORMER IS WIRED FOR APPROPRIATE SYSTEM POWER SUPPLY. INSULATE SEPARATELY ANY UNUSED LEADS. POLARITY IS NOT INDICATED. TYPICAL TRANSFORMER SHOWN. SEE TRANSFORMER LABEL FOR LEAD COLOR CODING. A PUSH TO RESET FUSEHOLDER-TYPE THERMAL CIRCUIT BREAKER IS MOUNTED ON THE TRANSFORMER. THE CIRCUIT BREAKER IS WIRED IN SERIES WITH ONE SIDE OF THE TRANSFORMER SECONDARY WINDING.

3. SEE FIGURE 1 ON SHEET 3 OF THIS DRAWING FOR BOARD LAYOUT FOR SENSOR LOCATIONS, TEMPERATURE SETTING NOTE, AND SENSOR RESISTANCE VERSUS TEMPERATURE GRAPH.

4. SEE FIGURE 2 ON SHEET 3 OF THIS DRAWING FOR COMPRESSOR CONTROL MODULE OPERATION.

5. WHEN "FS-L" AND "FS-S" ARE NOT USED, THIS WIRE CONNECTS DIRECTLY TO TERMINAL 5 OF "TB3".

6. WIRED AS SHOWN FOR OPEN LOOP OR HIGH TEMPERATURE CLOSED LOOP APPLICATIONS. FOR LOW TEMPERATURE CLOSED LOOP APPLICATIONS, MOVE THIS WIRE FROM TERMINAL 6 TO TERMINAL 7 ON "TB4".

7. WHEN OPTIONAL "LTC" IS NOT USED, THESE TWO WIRES ARE SPLICED TOGETHER.

8. WIRED AS SHOWN FOR OPEN LOOP OR HIGH TEMPERATURE CLOSED LOOP APPLICATIONS. FOR LOW TEMPERATURE CLOSED LOOP APPLICATIONS, MOVE THIS WIRE FROM TERMINAL 8 TO TERMINAL 9 ON "TB5".

9. WHEN OPTIONAL "LTC" IS NOT USED, THESE TWO WIRES ARE SPLICED TOGETHER.

10. WHEN "CHR" IS NOT USED, THIS WIRE CONNECTS DIRECTLY TO EITHER TERMINAL 1 OR **Y-OUT** ON "PM" --OR-- WHEN "PM" IS NOT USED, TO TERMINAL R ON "TB1".

11. IF POWER MONITOR OUTPUT CONTACTS DO NOT TRANSFER WHEN POWER IS APPLIED TO UNIT (BICOLOR LED GLOWS GREEN UNDER NORMAL CONDITIONS AND RED DURING FAULT CONDITIONS):
    1. VERIFY THAT ALL THREE PHASES ARE PRESENT AND ARE OF THE CORRECT VOLTAGE. IF ALL THREE PHASES ARE PRESENT AND ARE OF THE CORRECT VOLTAGE, PHASE ROTATION MAY BE INCORRECT. PERFORM STEP 2.
    2. DISCONNECT POWER TO THE WW* UNIT. VERIFY THAT POWER IS IN FACT DISCONNECTED. SWAP ANY TWO OF THE THREE UNIT POWER SUPPLY WIRES. WHEN POWER IS REAPPLIED, OUTPUT CONTACTS SHOULD NOW TRANSFER.

12. TYPICAL FIELD CONTROL WIRING SHOWN. ACTUAL FIELD WIRING MAY DIFFER FROM WIRING SHOWN HERE. USE 18 AWG MINIMUM FOR FIELD 24 VOLT CONTROL WIRING. TYPICAL REMOTE SWITCH SHOWN. REMOTE SWITCH MAY BE SUPPLIED BY OTHERS OR IS AVAILABLE AS AN OPTIONAL ACCESSORY FROM THE FACTORY. MINIMUM PILOT DUTY RATING OF EACH POLE OF REMOTE SWITCH IS 24 VOLT-AMPERES @ 24 VOLTS AC WHEN CONNECTED AS SHOWN.

13. "RVS1" AND "RVS2" ARE USED ONLY WITH WWR MODELS AND ARE ENERGIZED IN COOLING MODE.
"RVS1" AND "RVS2" ARE NOT USED WITH WWC AND WWH MODELS.

14. AQUASTATS "TS-H" AND "TS-C" ARE NOT USED WHEN OPTIONAL FACTORY INSTALLED TEMPERATURE CONTROLLER "TC" IS FURNISHED. TYPICAL AQUASTATS SHOWN. AQUASTATS MAY BE SUPPLIED BY OTHERS OR ARE AVAILABLE AS AN OPTIONAL ACCESSORY FROM THE FACTORY. MINIMUM PILOT DUTY RATING OF EACH POLE OF AQUASTAT IS 24 VOLT-AMPERES @ 24 VOLTS AC WHEN CONNECTED AS SHOWN.

15. THIS WIRE CONNECTS DIRECTLY FROM TERMINAL S1 TO TERMINAL Y1 ON "TB1" WHEN OPTIONAL TEMPERATURE CONTROLLER "TC" IS NOT FURNISHED.

16. THIS WIRE CONNECTS DIRECTLY FROM TERMINAL S2 TO TERMINAL Y2 ON "TB1" WHEN OPTIONAL TEMPERATURE CONTROLLER "TC" IS NOT FURNISHED.

17. WHEN OPTIONAL TEMPERATURE CONTROLLER "TC" IS FURNISHED, INSTALLER MUST PROGRAM CONTROLLER. REFER TO TEMPERATURE CONTROL INSTALLATION INSTRUCTIONS.
WITH REVERSE-CYCLE WWR UNITS, PROGRAM CONTROLLER AS ONE STAGE COOLING AND ONE STAGE HEATING. STAGE 1 IS THE COOLING STAGE AND STAGE 2 IS THE HEATING STAGE.
INSTALL SENSOR ON THE WATER INLET PIPE (LOAD COIL).

18. CONDUCTOR "O" REQUIRED WITH WWR REVERSE CYCLE UNITS.
CONDUCTOR "O" NOT USED WITH WWC COOLING AND WWR HEATING UNITS.

19. "CHR" IS USED ONLY WITH "WWR" UNITS.
"CHR" IS NOT USED WITH "WWC" AND "WWH" UNITS.

20. COMPRESSOR RELAY CONTACTS ARE PROVIDED TO OPERATE AN EXTERNAL PILOT DUTY LOAD (SUCH AS A PUMP RELAY COIL) WITH THE COMPRESSORS.
    - ❖ AN EXTERNAL LOAD POWERED BY TRANSFORMER "TR1" IN THE WW* UNIT MUST NOT EXCEED 12 VA SEALED (96 VA INRUSH) @ 24 VOLTS AC.
    - ❖ EXTERNAL LOADS POWERED FROM AN EXTERNAL SOURCE ARE LIMITED TO CLASS 2 CIRCUITS ONLY (30 VOLTS AC MAXIMUM). EXTERNAL LOAD CHARACTERISTICS MUST NOT EXCEED 10 AMPS MAKE, 1 AMP BREAK. **MAINTAIN SEPARATION BETWEEN CLASS 2 CIRCUITS OF DIFFERENT SOURCES.**
    - ❖ PROVIDE DISCONNECTING MEANS, EQUIPMENT GROUNDING, AND OVERCURRENT PROTECTION AS REQUIRED.

WIRING DIAGRAM # 0962I-2635A, REV. B
WW* 360, 420
460-3-60, 575-3-60

Optional Low Temperature Control Board "LTC" – 460-60-3, 575-60-3, Unit Sizes 360, 420

The control board is powered by 24 volts AC, 50/60 hertz which is applied to the 24 VAC terminals. The control will energize the output relays (COM 1 makes connection with NO 1 and COM 2 makes connection with NO 2), only if the temperatures of both Sensor 1 and Sensor 2 are above the selected temperature which is 20°F or 35°F.

Note: *Always disconnect power to WW* unit before moving jumpers.*

While the output relays are energized, the control keeps monitoring Sensor 1 and Sensor 2 to make sure that the temperature of the sensors is always above the selected temperture, the control will de-energize both ouput relays until the temperature of the sensor is 2.5 degrees above the selected temperature. For example, you set the temperature to 20°F. The output relays will de-energize when the sensor temperature drops below 20°F. The control will re-energize the output relays when the sensor temperature rises above 22.5°F. Additionally, the control will monitor each individual sensor to make sure it isn't broken or shorted. If either Sensor 1 or Sensor 2 fails short or open before or during operation, the control will de-energize both output relays until the sensor is repaired or replaced.

Table 10: LTC board sensor locations

Model	Sensor 1	Sensor 2
WCA	Liquid Out - Load Coil 1	Liquid Out - Source Coil 1
WHA	Liquid Out - Load Coil 1	Liquid Out - Source Coil 1
WRA	Liquid Out - Load Coil 1	Liquid Out - Source Coil 1

Figure 13: "LTC" board jumper settings

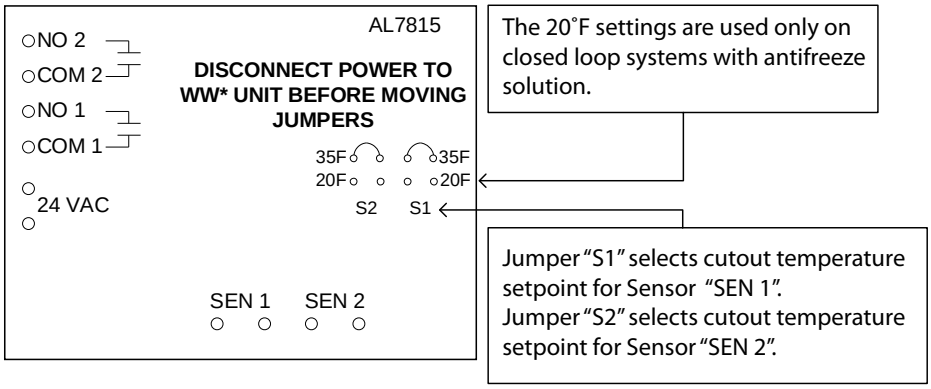
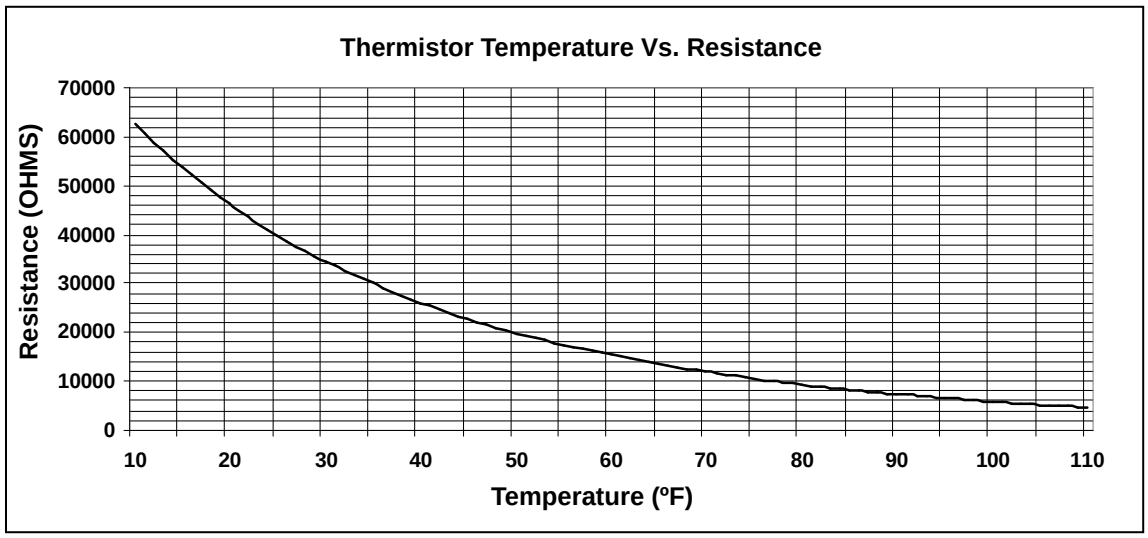


Figure 14: Thermistor temperature vs. resistance graph



Compressor Control Module Functional Operation – 460-60-3, 575-60-3, Unit Sizes 360, 420

Power:

For proper operation there must always be 18 to 30 volts AC present at the R and C terminals.

Time Delays:

1. **Anti-short cycle:** provides the compressor with short cycle protection for a selectable time of 10 seconds (for servicing only) or 5 minutes (normal operationalsetting). This feature is enabled upon power loss to the circuit board, loss of the Y signal, or the opening of a switch connected to the HPS or LPS terminals. If the selecto shunt is not in place, the circuit will default to a 5 minute anti short-cycle delay.
2. **Delay on make:** Delays the turning on of the compressor contactor for a selectable time of 3 or 6 seconds every time the Y signal coalls. If the selector shunit is not in place, the circuit will default to a 6 second delay on make.
3. **Low Pressure Bypass:** Allows time for the low side pressure to build up enough pressure at start up for the 60 psig low pressure switch to close. The circuit will offer a selectable timing range of 90, 120, 180, or 300 seconds. This time delay will start upon a Y call from the thermostat. Should the 60 psig low pressure switch still be open after the selected delay expires, the compressor will de-energize and the alarm will energize. This will be defined as an LPS fault, (factory set for 90 seconds). If necessary to increase the delay, select the smallest amount of bypass time delay that allows the compressor to start and operate.

Note: *The 60 psig low pressure switch is jumpered out in low temperature closed loop system applications using antifreeze solution.*
Also note tht the 35 psig low pressure switch is connected in series with the high pressure switch to the HPS terminals and is never bypassed.

Operation Of The HPS Terminals

Switches connected to the HPS terminals are connected in series with the Y signal through the circuit board. These switches are also connected in series witht the T1 output in order to provide an immediate response if a switch were to open. If a switch conncecte to the HPS terminal should open, the status LED will blink once.

Operation Of The LPS Terminals

The 60 psig low pressure switch (brown leads) is connected to the LPS terminals in series with the Y signal through the circuit board. The 60 psig low pressure switch is connected in series with the Y signal to the processor only. This will allow the control to monitor the low pressure switch status and initiate the bypass delay. If the 60 psig low pressure switch should open, the status LED will blink twice.

Normal Cycle

A normal cycle will begin with 24 VAC applied to the R and C terminals on the circuit board. Once the control is powered up, the processor will read the Y signal to determine if it is calling. If it is calling and the switches connected to the HPS terminals are closed, the delay on make and low pressure bypass timers will initiate.

If a switch connected to the HPS terminals is open, the control will enter the lockout mode. After the delay on make time expires, the compressor contactor will energize. It will remain energized as the low pressure bypass timer counts down.

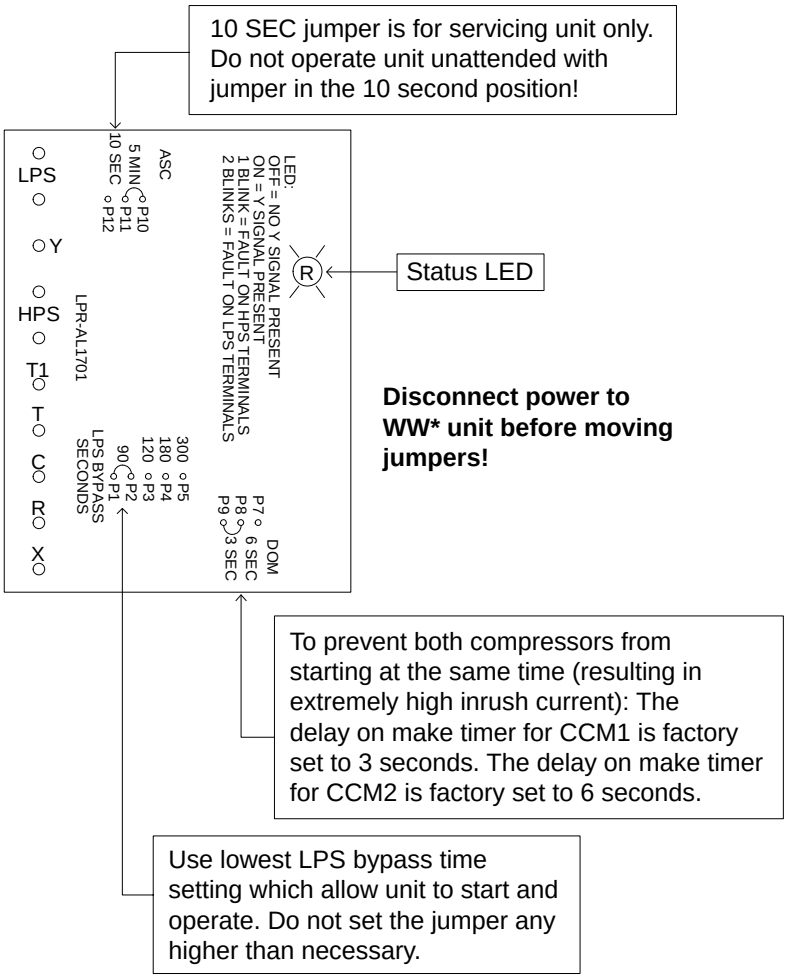
If the 60 psig low pressure switch is closed after the timer expires, the compressor will remain energized. If it is still open, the control will enter the lockout mode.

If power is lost, or the Y signal is removed, or an HPS or LPS terminal switch fault is detected while the compressor contactor is energized, the unit will initiate the anti short-cycle delay.

Alarm/Lockout

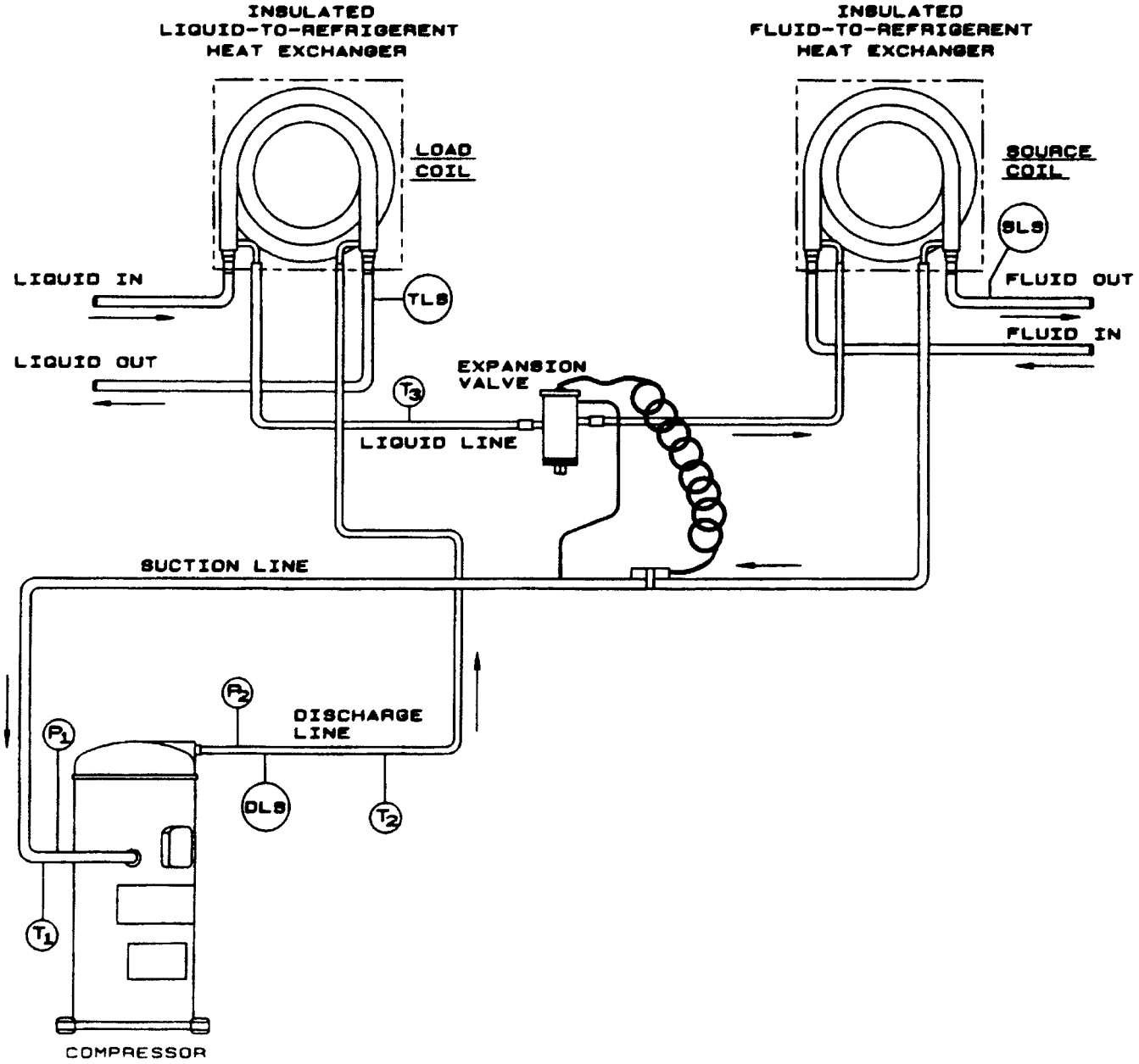
The alarm terminal will output the R signal and will only be energized as a result of an HPS or LPS fault. An HPS fault is defined as the opening of a switch connected to the HPS terminals for any amount of time. An LPS fault is defined as the 60 psig low pressure switch open after the bypass time. If any of these conditions are true, the unit will de-energize the compressor and energize the alarm. This will be defined as a lockout condition. To reset a lockout condition, the pressure fault must be corrected and the Y signal from the thermostat must be cycled.

Figure 15: Compressor control module functional operation



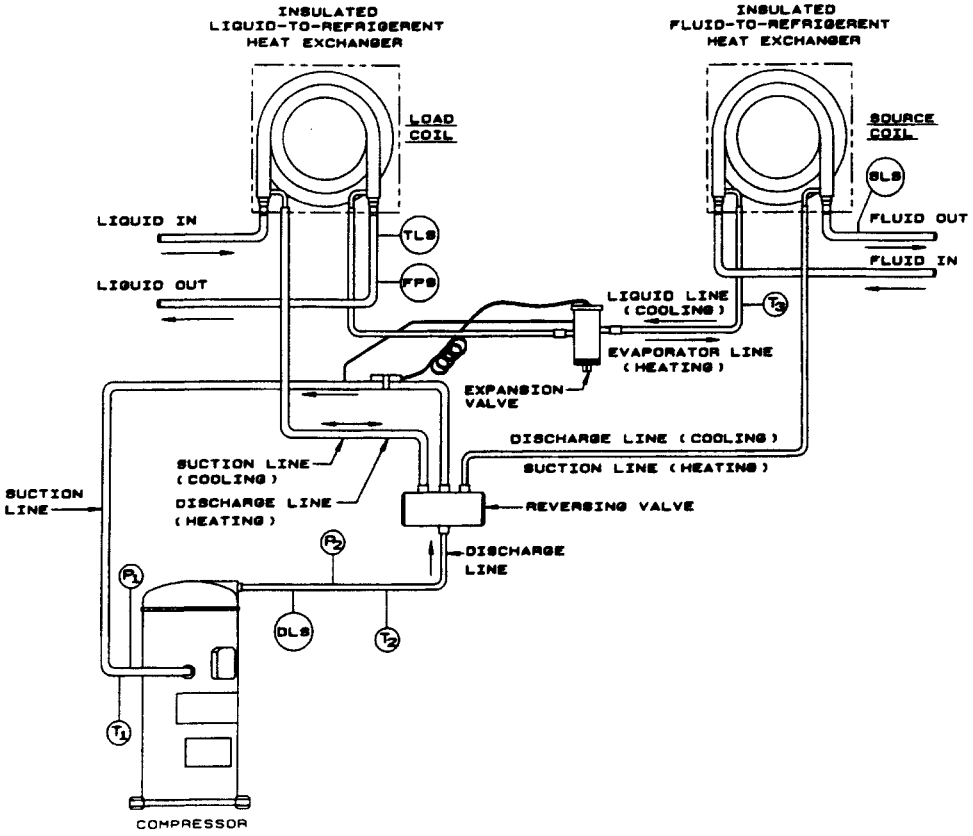
Model WHA

Load Coil = Heater-Condenser, Source Coil = Evaporator

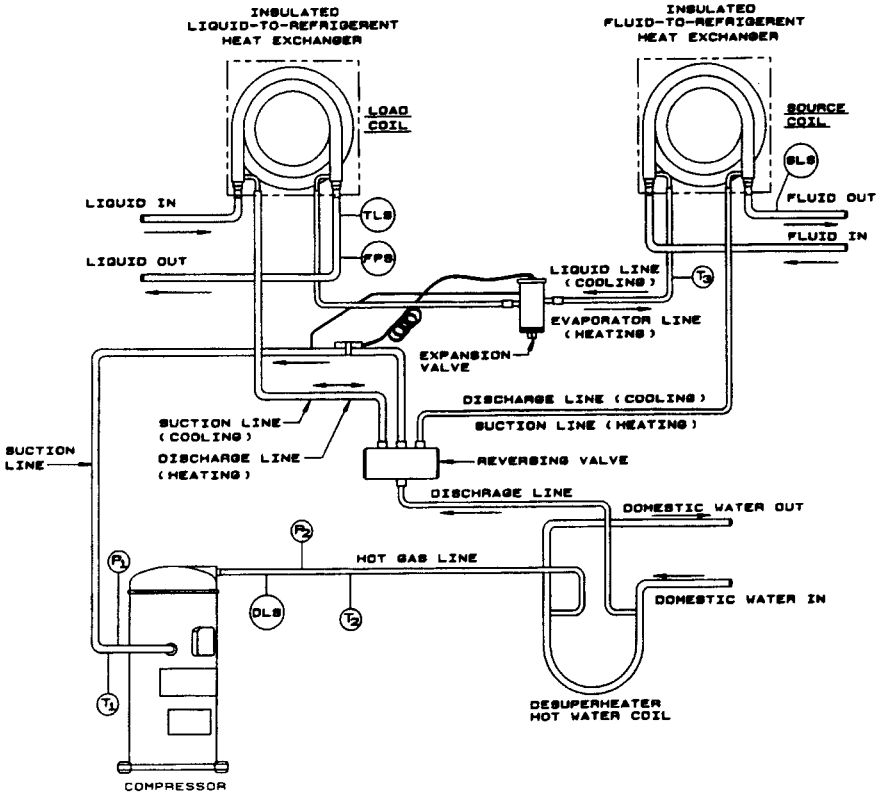


Model WRA

Reverse Cycle, No Domestic Hot Water

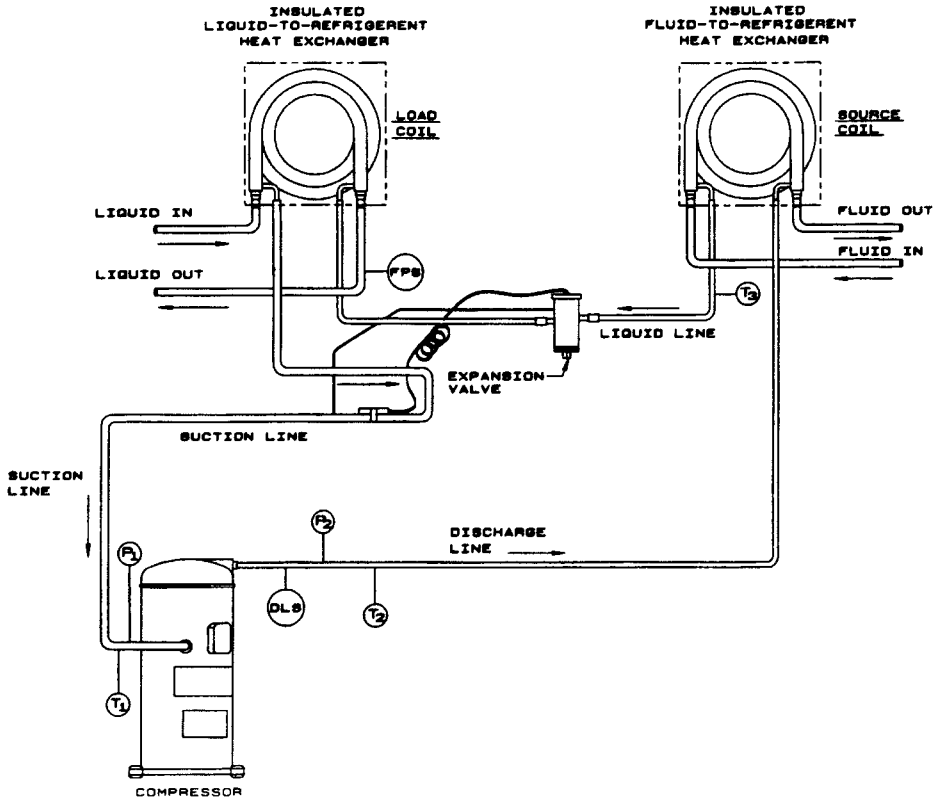


Reverse Cycle, With Domestic Hot Water H.R. Coil

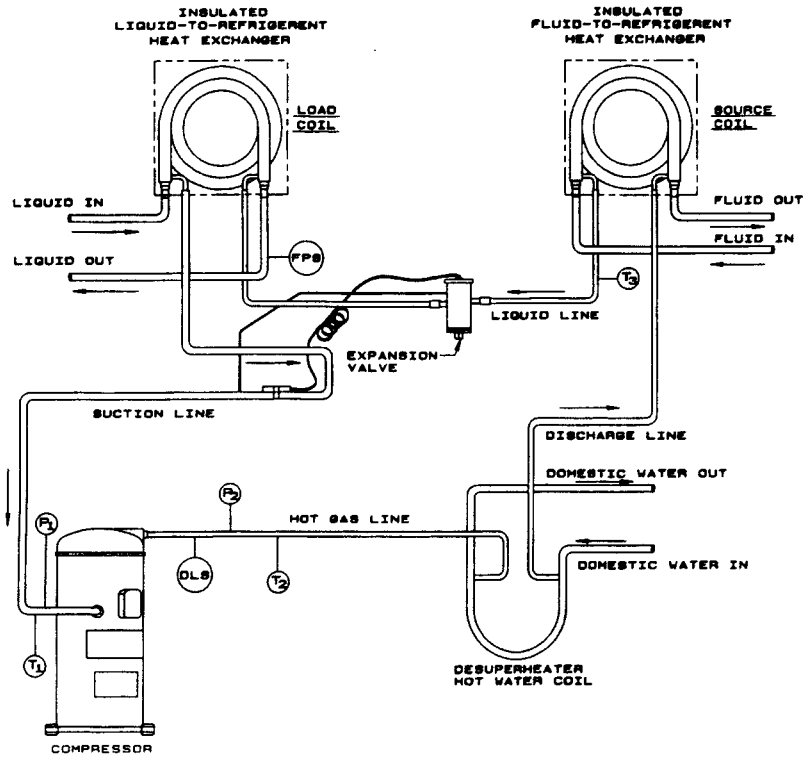


Model WCA

Load Coil = Chiller-Evaporator, Source Coil = Condenser, No Domestic Hot Water



Load Coil = Chiller-Evaporator, Source Coil = Condenser With Domestic Hot Water H.R. Coil



General Information

Customer Name _____ Dealer Name _____

Address _____ Address _____

_____ _____

_____ _____

Phone # _____ Phone # _____

Product Information

Unit Model # _____

Unit Serial # _____

Source Coil Application ☐ Ground Source ☐ Open Well ☐ Other _____

Load Coil Application ☐ Fan Coil Unit ☐ Radiant Htg/Clg Coils ☐ Baseboard Radiation

☐ Other _____

Voltage _____ Amperage _____ Phase _____ Transformer Volts _____

Unit Function

Heating (WRA & WHA)	**Entering**	**Leaving**	**Diff (TD)**
Load Liquid Temperature, °F From fan coil unit, radiant coils, baseboard radiation, etc.			
Source Liquid Temperature, °F From well, geothermal closed loop, plate heat exchanger, etc.			
Cooling (WRA & WCA)			
Load Liquid Temperature, °F To fan coil unit, radiant coils, baseboard radiation, etc.			
Source Liquid Temperature, °F From well, geothermal closed loop, plate heat exchanger, etc.			
Load Fluid Pressure FT. HD or PSIG [Note 1 PSIG = 2.31 FT. HD]			
Source Fluid Pressure			

Load GPM _____ **Source GPM** _____

Source Fluid ☐ Water ☐ Anti-freeze

HA or HR = 500 x TD x GPM **For Anti-Freeze solution = 485 x TD x GPM**

Calculation (Load) _____ x _____ x _____ = _____

500 or 485 TD GPM HA or HR

Check product performance table "Antifreeze Correction" on page 13 to determine if calculation is within 10% of table value.

All models employ an electromechanical control system for maximum reliability.

Symptom	Possible Trouble	Method of Finding
1. Noisy Operation.	a. Chattering contactor noise.	a. Check contactor points, check for adequate control voltage from transformer, and check control circuit for shorts or breaks, check thermostat.
2. Compressor will not start.	a. Lock Out Relay Open.	a. Turn thermostat off, then on.
	b. Loose electrical connections.	b. Check all connections at contactor and compressor terminal box for loose or burned connection on terminal.
	c. Refrigerant charge lost, low pressure cutout open.	c. Check for R-410A pressure.
	d. No control voltage to the compressor contactor.	d. Check for 24 volts across contactor coil. If no voltage, check for thermostat circuit trouble or for compressor safety controls open.
	e. Contactor pulled in, but compressor still won't start.	e. Check compressor overload circuit, contactor points, etc.
3. Compressor starts but hums and trips out on overload.	a. Run capacitor could be bad.	a. Check capacitor.
	b. Voltage may be low.	b. Check it.
	c. Seized bearings on compressor.	c. Replace compressor.
4. Compressor starts but cuts out on low pressure control.	a. Low liquid flow (heating cycle).	a. Check liquid flow.
	b. Low refrigerant charge.	b. Remove refrigerant, repair leak and recharge.
	c. Restriction in liquid refrigerant line.	c. Check pressures and look for frosting across the restriction.
	d. Low airflow (cooling cycle).	d. Check and correct.
	e. Low pressure cutout may have incorrect pressure function.	e. Check low pressure cutout for correct pressure.
5. Compressor starts but cuts out on high pressure control.	a. Condenser coils limed or restricted.	a. Check it. (Open systems)
	b. Malfunctioning high pressure control.	b. Check that the control is cutting out at the correct pressure.
	c. Reduced or lack of liquid flow.	c. Check liquid.
	d. Reduced evaporator air flow (heating cycle).	d. Check air flow.
6. Compressor runs on heating cycle, but does not heat.	a. Reversing valve may be defective.	a. See that it has shifted.
	b. Thermostat may be defective.	b. Check wiring diagram.

#	Description	036	048	060	072	120	150	180	240	300	360	420
1	Expansion Valve*	564-672	564-672	564-670	546-671	564-670	564-671	561-664	564-673	564-676	564-676	564-676
2	Contactor (Compressor)	841-040	841-040	841-040	841-040	841-039	841-039	841-072	841-072	841-072	841-155	841-162
		841-039	841-039	841-039	841-039	841-021	841-021	841-039	841-039	841-039	841-072	841-065
3	Reversing Valve	564-677	564-508	564-609	564-508	564-508	564-608	564-608	564-574	564-574	564-589	564-589
4	Microprocessor Board (comp ctrl)	872-089 (1)	872-089 (1)	872-089 (1)	872-089 (1)	872-089 (2)	872-089 (2)	872-089 (2)	872-089 (2)	872-089 (2)	872-089 (2)	872-089 (2)
5	Capacitor (Compressor)											
6	High Pressure Switch (HP)	844-142	844-142	844-142	844-142	844-142	844-142	844-142	844-142	844-142	844-142	844-142
7	Low Pressure Switch (LP1)	844-151	844-151	844-151	844-151	844-151	844-151	844-151	844-151	844-151	844-151	844-151
8	Fluid/Refrigerant Coil S/W Copper	512-200	512-201	512-201	512-259	512-201	512-202	512-200	512-201	512-202	512-201	512-202
8	Fluid/Refrigerant Coil S/W CU-NI	512-200	512-201	512-201	512-259	512-201	512-202	512-200	512-201	512-202	512-201	512-202
9	Transformer	846-056	846-056	846-056	846-056	846-129	846-129	846-129	846-129	846-129	846-129	846-129
10	Low pressure switch (LP2)	844-150	844-150	844-150	844-150	844-150	844-150	844-150	844-150	844-150	844-150	844-150
11	230/3 Compressor	800-840	800-805	800-820	800-803	800-821	800-804	800-800	800-812	800-1014	800-814	800-914
12	Reversing Valve Coil	874-209 (1)	874-209 (1)	874-209 (1)	874-209 (1)	874-209 (2)	874-209 (2)	874-209 (2)	874-209 (2)	874-209 (2)	874-209 (2)	874-209 (2)
13	Refrigerant Charge R-410A lb.	2.8	3.5	4.4	5	5.5	8.5	16	20	32	35	40

***** Where same valve is used in two or more units superheat settings may differ. Consult factory for valve with correct setting.

People and ideas you can trust.™

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To find your local service office, visit www.DaikinApplied.com or call 800-432-1342.

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